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ABSTRACT

The following are among the 45 papers included in this proceedings: "Labor Force Changes in the United States: Implications for Education and Training" (Kutscher); "Industry, Employment, and Family Income: Wisconsin's Status" (Stoner); "Future Demographic and Social Trends" (Zach); "International Business in Wisconsin's Future" (Shank); "Wisconsin's Economy in the Global Marketplace" (Somersan); "Changing American Economy" (Zempel); "The Role of Wisconsin Electric Power Company in State Economic Development" (Berman); "Manufacturing in Wisconsin: Times Are Changing" (Kinney); "Future Skill Needs as Seen by Harnischfeger Industries, Inc." (DeMaster); "Agriculture in Transition: Educational Challenges of the New Farm Management" (Grossi); "Biotechnology and Its Effect on Agriculture" (Brill); "Prospectus of Wisconsin Agriculture: 1987 and in the Future" (Gunderson); "Educating for Change" (Weisensel); "Home Health Care: The Future Is Now" (Barmore); "Current Health Care Issues in Wisconsin: HMO Provider Perspective" (Brady); "Health Care Must Change if It Is to Survive" (Hanser); "Role of Services in the U.S. Economy" (Duncan); "Economic Development Potential of Service Sector Industries in Wisconsin" (Wade); "Insurance Industry" (Johnson); "Importance of Foodservice to Future of Working Wisconsin" (Lump); "Innovations in Education: 30 Years after Sputnik. Implementation and Inertia" (Bransford); "Communications Technology: Implications for Wisconsin" (Bornstein); "Structuring Expectations: Telecommunications in the 1990s" (Weston);

"Computers, Schools, and the Work Place" (Long); "Computer Technology in the Next 20 Years" (Beetem); "Impact of the Computer Industry on Working in Wisconsin" (Groom); "Manufacturing Must Key-in to Advancing Computer Technology" (Lauer); "Space Station: The Next Logical Step" (Cook); "Wisconsin's Space Future" (Rice); "A Retrospective and Prospective Look at Some of the Nation's Resource Issues" (Frederick); "Energy and Wisconsin's Economy" (Brand); "Timber Resources and Products" (Lange); "Environmental Management: A Global Profit Center" (Braun); "Outlook for Work, Productivity, and Labor/Management Relations" (Oswald); "Changing Nature of Work, the Work Place, Managerial Behaviors and Implications for Wisconsin's Economy" (Witte); "High School/Technical College Connection" (Parnell); "Human Resource Development" (Broomfield); and "Future of Education and Training" (Bellman). Summaries, assumptions and issues, and additional resources are included. (MN)

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THE FUTURE OF WORKING WISCONSIN

Proceedings from

"The Future of Working Wisconsin"
Conference

1987

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Wisconsin Board of Vocational, Technical, and Adult Education

VTAE
Vital To America's Economy

The Vocational Studies Center

The Future of Working Wisconsin

Proceedings from "The Future of Working Wisconsin" Conference

February 24-26, 1987
Milwaukee, Wisconsin

Gabrielle Banick Wacker, Editor

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Adult Education

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PREFACE

The welfare of the nation and the quality of life for all citizens depends upon the ability to plan for the future and to provide a workforce that is not only effective and efficient, but one that can compete internationally. In planning for the future workforce, and in celebration of the VTAE's system 75th anniversary, the Wisconsin Board of Vocational, Technical and Adult Education enlisted the Vocational Studies Center to implement "The Future of Working Wisconsin" project.

As part of this effort, **"The Governor's Conference on the Future of Working Wisconsin"** was held February 24-26, 1987 in Milwaukee, Wisconsin. Governor Thompson should be recognized for not only supporting this activity very early in his term, but for his attendance and participation in the conference. More than 800 national, state, and local leaders from business, industry, agriculture, government, labor, and education came together to consider the needs of the workforce in the 21st century. This book contains the proceedings from the conference. In addition, an implementation section is included within each subject area that identifies assumptions, issues, and resources. Both sections will assist leaders in future planning by portraying the "big picture" of work in the next 20 years.

Contributing to the activity's success was an effective planning committee that represented many state and local agencies. Members of the committee and their respective agencies are listed in the Appendix.

The conference organizers are indebted to the outstanding array of presenters who also developed papers for this book. We are particularly grateful to our national speakers. They included key business, industry, and government leaders who were complemented by state speakers that discussed the implications of national trends for Wisconsin.

Many other individuals should be recognized for the success of the conference and this report, including Wisconsin State Board of VTAE staff members who not only participated in conference planning and implementation, but developed summaries of each topic area.

The Research, Planning and Development Subcommittee of the VTAE Administrators' Association also contributed to the book's usefulness by identifying assumptions, issues, and resources for each section. These efforts were coordinated by Mary Curran of Northeast Wisconsin Vocational, Technical and Adult Education District and Jane Svennevig of Blackhawk Technical College.

Recognition should be given to the many Vocational Studies Center staff members who contributed to the project's success. Among them, the work of Roger Lambert, Judith Rodenstein, Gabrielle Banick Wacker, and Mary Thompson was noteworthy. Beth J. Fritz provided editing assistance; Kim Verhage and Terri Bleck prepared the final manuscript; and Patricia Patterson provided assistance throughout the project. Roxanne Joyce of the State Board should also be recognized for her supportive efforts in conference work.

The real success of the conference was the result of the 800 future-oriented individuals from business, industry, agriculture, government, and education who participated with enthusiasm throughout the three days. We thank each of you for your contribution.

Merle E. Strong
Project Director and
Director, Vocational Studies Center

HOW TO USE THIS BOOK

This book can be used as a resource in planning for future education and training programs. It is organized around the following topic areas:

- Demographics;
- Economics;
- Manufacturing and industrial development;
- Agriculture, agribusiness, and biotechnology;
- Health care delivery;
- Service industries;
- Communication technology;
- Computer technology;
- Aerospace technology;
- Energy and natural resources;
- Quality and worker productivity;
- Opportunities for working Wisconsin; and
- The future of education and training.

National and state speakers contributed papers describing future work in their area of expertise. The papers appear in the beginning of each section. Most papers are accompanied by references. A brief summary of the presentations and discussions from **"The Governor's Conference on The Future of Working Wisconsin"** is included along with assumptions, issues, and resources relevant to each topic area. These were identified by the Research, Planning, and Development Subcommittee of the VTAE Administrators' Association during several workshops as part of their 1987 professional development activities and may help put in perspective the VTAE system's role in training Wisconsin's future workforce.

This book provides information that can be considered in examining future workforce trends and projections. Personnel at the national, state, regional, and local levels may find the information useful in working with:

- Advisory councils and occupational advisory committees;
- State and local board members;
- Administrators of vocational programs;
- General education administrators;
- Representatives from business, industry, and agriculture;
- Private industry councils;
- Economic development personnel; and
- Strategic planners.

THE FUTURE OF WORKING
WISCONSIN

The Impact of Demographic Trends on the Future of Work and the Family

Several demographic and social trends that will likely influence work and family life in the future include: Strengthening the concept of "family" because of changes in values, personal economics, and even longevity; the threat of AIDS and growing fear of its spread; the increasing size and influence of the elderly population; and the dynamic nature of work with increasing automation and creative entrepreneurial potential.

In so far as these trends will be a part of society in general, they will also impact life in the state of Wisconsin.

David M. Zach
Innovative Futures

Labor Force Changes in the United States: Implications for Education and Training

Ronald E. Kutscher

The U.S. labor force has undergone significant changes within the past 20 years. Further changes are predicted for the next 20 years. This paper will identify the predicted changes and discuss their implications for education and training. The information presented here is taken from a longer paper by the author (Kutscher, 1986).

Factors Important to Job Growth in the U.S.

Job growth in the U.S. has been far more favorable than for most other industrialized countries. In explaining the reason for this, it is important to emphasize two principal points about U.S. job growth:

- It has covered a long period of time--at least 25 years; and
- It has been highly concentrated in a few sectors of our economy.

Factors that seem to be important to U.S. job growth can be grouped into broad or macro factors and specific or micro factors. The macro or economy-wide factors include the dynamic U.S. labor market, which can be illustrated in two ways:

1) Nearly 8 percent of the workforce changed occupations over a recent 12-month period (Eck, 1984). This overall annual average occupational mobility rate varies considerably among different age groups and occupations.

2) In the U.S. in 1985, unemployment of a least 27 weeks or longer represented 15.4 percent of the unemployed, while 42.1 percent of those unemployed in 1985 had been unemployed on average 5 weeks or less. Further, in the course of one month to the next, about 45 percent of the unemployed were typically no longer unemployed. Of those who were no longer unemployed, about one-half found employment and the other one-half left the labor force.

The dynamic element contributes to job growth, because relatively few restrictions are placed on worker movement. This is due to less restrictions on employers including less spread between wages and total compensation in the form of mandated or legislated costs and other factors that enter into the explicit or implicit contract between an employee and employer. Less restricted employers are more willing to hire workers with varying degrees of training.

Thus, I believe the relative lack of credentials required for a broad range of jobs in the U.S. is another important factor contributing to the dynamic nature of the U.S. job market.

Thus, I believe the relative lack of credentials required for a broad range of jobs in the U.S. is another important factor contributing to the dynamic nature of the U.S. job market. While difficult to quantify, it can be illustrated by the fact that many new hires, even in highly-skilled fields such as engineering, typically do not have a degree in that particular engineering field.

These characteristics of a dynamic labor force help to describe the U.S. economy and job movement. Also, because of employment growth in the U.S., there is more voluntary job movement, which should--at least in the long run--bring about a better match between workers and job requirements.

Factors Important to Job Growth in Individual Sectors

Four industries--the restaurant industry, other retail trade, business services, and medical services--have been most important to U.S. job growth. Reasons for job growth differs among each of these.

In the medical services industry for example, several factors enhanced job growth, such as:

- Significant expansion of both private and public health care coverage and insurance over the past 25 years;
- More private delivery of health care services in the U.S. than in many other industrialized countries;
- Technological improvements in health care that usually add employment directly to the medical sector, because of new technicians necessary to install, repair, and operate new diagnostic or treatment devices.
- Few new medical technological developments that displace other equipment or workers associated with that equipment.

Business services are characterized by ease in forming a new business. In this country, relatively few restrictions exist (such as zoning, licensing, or certification) in forming new businesses of this type.

Consequently, an important factor in this industry's job growth has been new businesses. The U.S. Department of Labor data indicated that between 1975 to 1983 the increase in number of firms was 72 percent or an expansion rate of 6.2 percent per year. The demand for business services emanates from an ever-increasing need for these services and from a desire of firms to cut costs and become more efficient. Many businesses find not only the need for these services increasing, but that it is more cost effective to contract out for many business service activities. This contracting in turn, provides a demand for various business services.

For retail trade and the restaurant industry, the same measure of number of firms does not show the large expansion that was found for business services (15 percent for the restaurant industry and 6 percent for retail trade over the 1975 to 1983 period). However, other factors contributed to job growth, such as:

- Increases in income and in dual-earner households that have generated an increased business volume;
- Expansion in the operating hours for firms. Many retail trade and eating and drinking establishments have expanded their operating hours, some to 24 hours a day. This has added to business volume and also generated large increases in the number of jobs, since a business open 80 hours per week needs two full-time persons (or three or more part-time workers) for most jobs in the firm and more if the firm is open longer than 80 hours each week. These changes have no doubt been an important element in the large increase in part-time employment.

Still, all of these macro and micro factors may only be partial reasons for U.S. job growth. Other reasons such as cultural, urge for something new, not being locked into the same job as parents, willingness to take new business risks, and banking industry cooperation in business formation and expansion are also likely to be important contributing factors.

Projected Labor Force, 1984 to 1995

The labor force is projected by the U.S. Bureau of Labor Statistics (Fullerton, 1985) to reach 129 million persons in 1995; up form 115 million in 1985. The labor force is expected to grow at the slower rate of 1.2 percent per year over the 1984 to 1985 period than the 2.2 percent per year over the 1970 to 1985 period. The slowest growth is projected to occur during the early 1990s.

Blacks are expected to account for a larger share of the future labor force growth (nearly 20 percent) than their population share and a larger share than they have had in the past. This is due to higher birth rates among blacks during the past several decades. Women also are expected to account for a continued larger share of the labor force growth than men (over 60 percent). Women's large share of labor force growth is due to continued increases projected in their labor force participation rates. Further, because of the aging of the baby-boom generation and the continuing projected declines in participation among older persons, nearly three-fourths of the 1995 labor force is projected to be in the prime working ages

(25 to 54 years), compared with two-thirds of the 1984 labor force. The prime working age component of the labor force is projected to increase by 21 million for 1984 to 1995, while the overall labor force is projected to increase by only 15 million. Participation in the labor force among women ages 25 to 44 is expected to exceed 80 percent in 1995, up from 70 percent in 1984 and 50 percent in 1970. The continuing increases in labor force participation rates of women reflect rising career aspirations, gains in educational attainment, lower fertility rates, and changes in marital status.

Numbers of both young and old individuals in the labor force are projected to drop. Although participation rates for young people are projected to increase, the number of youth are expected to drop in the future. The young have faced considerable job competition in the recent past; however, now that their numbers are falling, there should be relatively less competition for jobs.

The most striking fact about the future youth population is that a larger proportion of it will be minorities. Since minority youth tend to have less education than white youth and more blacks than whites are concentrated in inner city areas where job opportunities are often limited, many of them can be expected to continue to have problems in finding suitable employment.

Projected Employment, 1984 to 1995

Projections prepared by the U.S. Bureau of Labor Statistics (Personick, 1985) show total employment reaching almost 123 million in 1995, a gain of nearly 16 million jobs from 1984. (The 1984 base is used because that was the base for the projections. If 1985 actual data are used, the projected growth for 1985 to 1995 is 12.8 million jobs.) The projected total employment of nearly 123 million in 1995 represents growth averaging 1.5 percent per year from 1984 to 1990 and 1.0 percent during 1990 to 1995. The earlier years of the projection period are affected by some residual recovery from the 1980 to 1982 recessionary periods, but later years reflect a long-term slowdown in employment growth related to the decline in labor force growth.

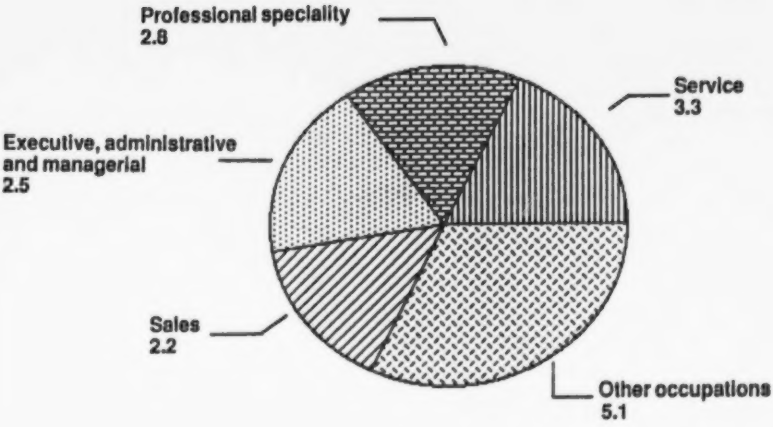
Nine out of every 10 new jobs projected will be in the service-producing industry.

More than 9 out of every 10 of these new jobs are projected to be added in a service-producing industry. The remainder are projected to be goods-producing jobs.

The 14.1 million growth in service-producing sector jobs is projected mainly for wholesale and retail trade (including the restaurant industry) and business, and professional and medical services.

The other industries within the service producing sector--government, transportation, communication, public utilities, finance, insurance, and real estate are all projected to grow and provide an increase in jobs, but the number of jobs are relatively small.

Occupational Job Growth
1984 to 1995
(in millions)



Within the goods-producing sector, jobs in durable goods manufacturing industries are projected to rise by 1.5 million (from the 1984 base), but this gain will be partially offset by a slight decline in nondurable manufacturing employment. Overall manufacturing employment is projected to top 21 million by 1995, slightly below its 1979 peak.

Because the manufacturing job increase rate is slower than that for the total economy, manufacturing employment is projected to decline from 18.5 percent of total employment in 1984 to 17.2 percent in 1995. This decline will be most severe in nondurable goods industries, because they do not supply the capital equipment or defense goods expected to account for manufacturing growth. Employment in nondurable manufacturing is actually projected to show an absolute decline, from 8.0 million jobs in 1984 to 7.9 million in 1995.

As another of the goods-producing industries, construction is projected to benefit from the expected growth in capital investment, particularly after 1990. Nonresidential construction is projected to recover from the recent oversupply of commercial office buildings and to grow as factory modernization accelerates. In the projections prepared by the Bureau of Labor Statistics (Su, 1985), business expenditures on construction show an increase of 1.6 percent annually through 1990 and 2.6 percent a year from 1990 to 1995. As a result of these projected increases, construction employment from 1984 to 1995 is projected to expand at an annual rate of 1.0 percent and add over 700,000 jobs.

In addition to examining projected job changes at the sector level, it is informative to also examine expected changes among individual industries. The following shows projected changes in industry employment in three ways: (1) the most new jobs provided, (2) the most rapid rate of growth, and (3) the most rapid rate of decline. All of the declining industries are in agriculture and manufacturing.

Projected Changes in Employment*, Selected Industries, 1984 to 1995

Industries with the most new jobs	Number of new jobs
Business services	2,633
Retail trade, except the restaurant industry	1,691
Restaurant industry	1,203
Wholesale trade	1,088
Medical services, nec**	1,065
Professional services, nec	1,040
New construction	558
Doctors' and dentists' services	540
Hotels and lodging places	385
Credit agencies and financial brokers	382

Industries with the most rapid rates of growth:	Average annual percent change
Medical services, nec	4.3
Business services	4.2
Computers and peripheral equipment	3.7
Materials handling equipment	3.7
Transportation services	3.5
Professional services, nec	3.5
Scientific and controlling instruments	2.9
Medical instruments and supplies	2.8
Doctors' and dentists' services	2.6
Plastics products	2.5

Industries with the most rapid rates of decline:	Average annual percent change
Cotton	-4.2
Wooden containers	-3.6
Leather products, including footwear	-2.8
Iron and ferroalloy ores mining	-2.7
Sugar	-2.7
Leather tanning and finishing	-2.6
Railroad transportation	-2.6
Nonferrous metal ore mining, except copper	-2.6
Dairy products	-2.3
Blast furnaces and basic steel products	-2.2

*Includes wage and salary jobs, the self-employed, and unpaid family workers.

**nec = Not elsewhere classified.

Source: U.S. Bureau of Labor Statistics (Personick, 1985).

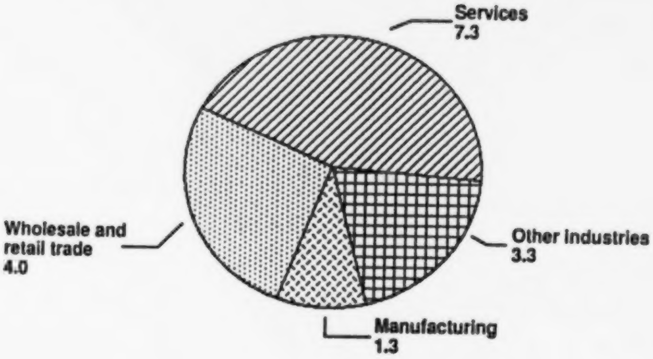
The industries projected to show the greatest number of new jobs are all service-producing industries, with the exception of new construction. The industries with the fastest rate of projected employment growth include five manufacturing industries and five service industries.

Projected Changes in Occupational Structure to 1995

Some occupations, especially in the clerical group, are expected to slow their growth rate considerably, while others, mainly blue-collar occupations that grew in the past, are expected to decline.

According to most recent projections prepared by the Bureau of Labor Statistics (Silvestri & Lukasiewicz, 1985), occupational employment growth trends over the 1984 to 1995 period are expected to depart from the recent past for some broad occupational groups and for a number of the detailed occupations. Some occupations, especially in the clerical group, are expected to slow their growth rate considerably, while others, mainly blue-collar occupations that grew in the past, are expected to decline. These changes are the result of a projected slowing of total employment growth, changes in industrial growth trends, and technological change affecting the occupational structure of industries. Many occupations that grew rapidly from the early 1970s to the mid-1980s are projected to grow faster than average, although this is slower than they grew in the past. Despite the slowing of total employment growth, a few occupations are expected to grow faster over the 1984 to 1995 period than over the previous 11 years.

Project Employment Growth by Industry Group, 1984 to 1995, (in millions)



Over the 1984 to 1995 period, three major occupational groups are expected to increase faster than the average for all occupations. These groups have the largest proportion of workers with a college education or specialized postsecondary technical training.

The executive, administrative, and managerial workers occupational group is projected to increase by 22 percent compared with a 15 percent growth rate for total employment. The demand for salaried managers is expected to grow rapidly as firms increasingly depend on trained management specialists. The projected rate of growth for professional specialty occupations is also 22 percent, leading to a projected increase of 2.8 million jobs.

Many occupations in this group are expected to increase quite rapidly, including computer-related occupations, engineering, and health specialties. Technicians and related support workers, with a 29 percent increase, are projected to grow the fastest of all the major occupational groups. This group also had the fastest growth rate from 1973 to 1984. The percent growth for all three of these groups, while faster than average, will in each case be slower than in the past.

Sales workers are projected to increase faster than average from 1984 to 1995 and as a result add about 2.2 million new jobs. The projected growth of 20 percent, however, is about half of that experienced from 1973 to 1984 when this group significantly increased its share of total employment.

The automation of clerical tasks is expected to slow the growth of many detailed occupations, including secretaries and typists.

Administrative support workers, including clerical, which grew about as fast as average during the 1973 to 1984 period, are projected to grow more slowly than average through the mid-1990s. This group is expected to add 1.8 million jobs during the 1984 to 1995 period, however, and remain the largest occupational group with 20.5 million workers in 1995. The rapid spread of computerized office equipment and other related office automation is already having an impact on the employment of clerical workers and is projected to have an even greater impact through the mid-1990s. The automation of clerical tasks is expected to slow the growth of many detailed occupations, including secretaries and typists and cause others, such as payroll and timekeeping clerks, to decline. As a result, the share of total employment accounted for by the administrative support group, is projected to decline from 17.5 percent in 1984 to 16.7 percent in 1995.

The large number of new jobs expected to be added by service workers reflects the economy's continued shift from goods production to services production.

Service occupations, excluding private household workers, are projected to continue to grow faster than total employment, despite a significant slowing of their growth rate. This occupational group is expected to account for more absolute job growth than any other broad group and to account for 3.3 million of the 16 million jobs expected to be added from 1984 to 1995. In contrast, during the 1973 to 1984 period, three other broad occupational groups--managers, professional workers, and clerical workers--each added more jobs than service workers. The large number of new jobs expected to be added by service workers reflects the economy's continued shift from goods production to services production.

Precision production, craft, and repair occupations are projected to grow by less than 12 percent, somewhat more slowly than total employment. Their share of total employment as a result is expected to decline slightly. Growth in these occupations is heavily tied to the growth of the construction and manufacturing industries in which they are concentrated, and manufacturing is projected to grow slowly.

The number of operators, fabricators, and laborers is projected to increase by only 7 percent from 1984 to 1995. Nevertheless, this represents a change from the 1973 to 1984 period when these occupations actually lost jobs. However, employment declined in many manufacturing industries where these workers were concentrated, because the effects of the 1982 to 1983 recession were still felt in many industries in 1984. Over the 1984 to 1995 period, manufacturing is projected to grow, albeit slowly. Many detailed occupations in this group--including machine operators, assemblers, and inspectors--are expected to be impacted by new technologies in manufacturing, such as computer-aided manufacturing and robotics.

Summary of Employment Trends

The U.S. must prepare a future for workers in the economy. Examining employment and population trends will help with this task. The following section summarizes these major trends.

1. The world population growth is projected to slow for the remainder of this century; most of the growth is expected in the less developed countries.

2. There has been a wide divergence between U.S. employment growth and the employment growth in other industrialized countries, in particularly western European countries. Recently, youth unemployment has been high in most developed countries expect Japan, Sweden, and Germany. The baby boom generation has a different timing in each country: Canada and U.S. had the baby boom in early 1970s; Western Europe in early 1980s; and Japan and Australia in the late 1980s.

3. Population growth in the U.S. is projected to slow; net migration is expected to be at least 20 percent of our population growth. The share of the U.S. population under 10-years-of-age will increase until the late 1980s and then begin a decline. The share of the population over 70 will continue to increase with a particularly sharp increase in the over 80 population.

4. Birth rates are higher among blacks and Hispanics, thus, the younger population will continue to show an increasing share of these groups.

5. In 1985 only 60 percent of white and 40 percent of black households were married-couple households. This share has been declining particularly for blacks. One in three black families were maintained by women alone.

6. Labor force participation rates of black and white women have been converging, while labor force participation rates for black and white men have been diverging.

7. Over the past 5 years nearly 90 percent of labor force growth has been among women, blacks, and Hispanics.

8. The labor force growth rate is projected to slow at least until 1995. New labor force entrants will number 1.3 million per year in the early 1990s compared to 3.0 million new entrants per year in the late 1970s. The share of labor force growth accounted for by blacks will be nearly 20 percent; women's share will be over 60 percent; 16 to 24-year-olds will decline and over 55-year-olds will also decline. All growth will come from those in the 25 to 54 age bracket.

9. The labor force participation rate for women 25 to 44 is projected to rise from about 70 percent in 1984 to 80 percent by 1995.

10. Employment growth is expected to slow; 90 percent of job growth is projected to be among the service producing industries of the economy. However, it is also important to note that manufacturing employment is projected to grow modestly and its output will continue to expand. At the same time a group of manufacturing industries have had sharp declines in both output and employment, and most of them are projected to continue that trend.

11. A high percent of past and projected job growth by occupation is found among highly-skilled professional, technical, and managerial jobs. The declining or slower growing occupations have been mostly in the lower-skilled jobs.

12. There has been a long-term secular increase in the unemployment rate over the past several decades. Teenagers made up 17 percent of the unemployed in 1985--down from the peak of 28 percent in 1974. Blacks, who make up 11 percent of the labor force, are 22 percent of the unemployed, a share that has been increasing as blacks share of the labor force increases. There is a strong inverse relationship between unemployment and education. In March 1985, the unemployment rates for those with less than 4 years of high school was 11.4 while the rate for those with 4 or more years of college was 2.4. The educational attainment of the workforce has been increasing; however, school dropout rates remain high, particularly for blacks and Hispanics; the share of the population graduating from high school and entering college has leveled off; and, the adult rate of illiteracy remains high.

13. Projections for supply of college graduates and demand for them show a narrowing of the oversupply.

14. Relative lack of credentialization for a wide range of U.S. jobs contribute to labor market dynamics; occupational mobility is high among U.S. workers, particularly among the young and those in lower-skilled occupations.

Education and Training Implications

What sort of worker will prosper in the future?

What sort of worker will prosper in the future? The Panel on Secondary School Education for the Changing Workplace addressed this question in their 1984 report. The information in this section was drawn from that report. Previous sections of this paper have dealt with many different trends expected in the U.S. work place. Among those important in accessing educational and training requirements are occupational mobility among the young; continued restructuring of America's economy both by industry and occupation; and a gradual shifting of this restructuring toward higher-skilled jobs and away from lower-skilled jobs. Yet, the answer to this question is simple: Future jobs will require workers who are able and willing to learn throughout their working lives. It is not possible to provide the specific education and training required by individuals for their entire working life in the 12 to 16 years most workers will spend in a formal education setting. Thus, those who succeed in the work place will know how to learn, be well grounded in fundamental knowledge, and have mastered concepts and skills that create an intellectual framework to which new knowledge can be added as the almost inevitable work place changes unfold.

It is in the basic intellectual skills, however, where young employees most often show the greatest deficiencies. Many lack the ability to draw correct inferences from written, pictorial, or mathematical information; to understand oral instructions; to develop alternatives and to reach conclusions; and to express their ideas intelligibly and effectively. All of these skills are important, even in entry-level jobs. Advancement to more responsible posts, to which most workers aspire, requires skills of an even higher order, including the ability to compose tables and reports, to consult reference and source materials, to apply mathematical concepts and procedures, to control complex equipment, and to address groups.

The need for adaptability and lifelong learning dictates a set of core competencies that are critical to successful careers.

The Core Competencies

Ability to read, write, reason, and compute;

Understanding of American social and economic life;

Knowledge of the basic principles of the physical and biological sciences;

Experience with cooperation and conflict resolution in groups; and

Attitudes and personal habits that make for a dependable, responsible, adaptable, and informed worker and citizen.

Together, these competencies comprise the skills needed to prepare a young person for an uncertain future. These competencies form the basis for all high-quality education. Education needed for the work place does not differ in its essentials from that needed for college or advanced technical training. All young Americans, regardless of their career goals, should achieve mastery of the core competencies up to their abilities. For those intending to enter the workforce directly after completing high school, additional training in specific vocational skills will increase employability and is naturally desirable. But no other skills, however useful or worthwhile, can substitute for the core competencies.

Noncollege bound young people may not require advanced or highly theoretical courses in mathematics, science, or other academic subjects, but they must have a working knowledge of these disciplines to allow them to perform job tasks accurately, correctly, and with understanding and to have the building blocks of learning necessary for adapting to inevitable future job changes.

Mastery of the core competencies to the best of one's abilities is both a necessary and reasonable goal. What differentiates students who end their education after high school from those that are college bound is not necessarily the ability or desire to learn; frequently, the differences are due to economic resources, social backgrounds, cultural exposure, life styles, aspirations, or values. These differences do not dictate lowering educational standards, but they suggest that variation in educational settings or techniques is beneficial. Some students learn best in a scholastic environment; others in settings closer to real life.

The list of core competencies required for success in employment provided here is not exhaustive, but rather illustrative. These competencies are transferable, vital to almost every job except the least-skilled, and essential to upward mobility and adaptability.

Command of the English Language. Although a second language may be useful in job mobility, all American young people, regardless of home or native tongue, need a functional command of standard written and spoken English.

Reasoning and Problem Solving. The capacity to reason and solve problems is the central indication of an educated person. The ability to understand the consequences of alternative courses of action is an essential condition for success in employment.

Reading. Each student must be able to read, comprehend, and interpret written materials. Job success often hinges on following written instructions or drawing inferences. Neither reading nor writing is taught separately in most high schools. However, every course in every academic subject can require students to read and write critically and extensively.

Writing. It has been said that a person can write no better than he or she can think. All students need to be able to organize information and state it clearly and concisely in a written form that is grammatically correct.

Mathematics. All students need to be able to understand and apply basic mathematics, at least through the elementary algebra level. An understanding of geometry and trigonometry is desirable.

Technology. Whether employed in a factory, farm, office, shop, or retail store, American workers need to feel comfortable with technology. Technical occupations of all kinds--in the fast-growing medical and health service fields, in communications, and in the military services--call on workers to deal effectively with mechanical and electronic equipment.

As the use of advanced technologies becomes ever more pervasive in our economy, schools must encourage students to acquire a firm grounding in science and technology. Lack of an adequate scientific background and technological experience has precluded many, especially women, from competing for large numbers of desirable jobs in the past.

Oral Communications. Success in any job requires the ability to communicate thought, knowledge, and information through speech, whether with supervisors, coworkers, customers, or the general public.

Social and Economic Studies. Understanding the ways employees and employers fit into the economic structure of the community and country is essential to an appreciation of one's own contributions and responsibilities.

The key to preparation for a changing work place is the ability to learn new jobs or new elements of an existing job. Mastered core competencies should provide each person with the building blocks necessary for the societal change. Specific technical skills will be gained through on-the-job training, advanced technical schools, or 4-year colleges. However, for the individual without these building blocks, these advanced steps become very difficult.

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Industry, Employment, and Family Income: Wisconsin's Status

This text was edited from a presentation made by Dena G. Stoner at "The Future of Working Wisconsin" conference.

There is no question that the employment picture in Wisconsin and the nation is changing. Between 1979 and 1985 Wisconsin captured 0.20 percent of the nation's nonfarm employment growth. In comparison, Arizona had 3.7 percent; Florida, 12.9 percent; Georgia, 5.4 percent; Massachusetts, 4 percent; Minnesota, 1.2 percent; and Texas, 13.3 percent. Wisconsin's gain should not be discouraging, because it was better than the loss of employment experienced by Illinois, Indiana, Iowa, Michigan, Mississippi, Montana, Ohio, Pennsylvania, and West Virginia.

Wisconsin's Employment History

In those same years between 1979 and 1985 Wisconsin lost 13 percent or 82,000 manufacturing jobs according to the Wisconsin Department of Industry, Labor, and Human Relations (Cibarich, 1986). This would not have been terribly problematic if the jobs that had taken the place of those manufacturing jobs were high paying. According to state figures, employment levels for all industries showed a 12,500 gain in number of jobs from December 1979 to 1985. Gains and losses within specific industries according to earning level are shown below.

Level of Average Annual Earnings and Employment Gains and Losses, 1979 to 1985

Earnings much above average		Job gain/loss
Mining		- 839
Construction		-15,030
Manufacturing		-82,057
Wholesale trade		+ 2,560
Transportation, communication, & public utilities		+ 5,158
	Total	-90,208
Earnings close to average		
Finance, insurance, & real estate		+10,478
Government		+ 6,670
	Total	+17,148
Earnings markedly below average		
Agriculture, forestry, & fisheries		+ 3,192
Retail trade		+20,393
Services & miscellaneous		+61,916
	Total	+85,501
Total Unemployment Compensation Covered Employment		+12,582

Source: Cibarich, 1986.

Workforce Changes

The present workforce in Wisconsin and the nation is the workforce that will be employed through the year 2000. The future challenge becomes one of redirecting and reeducating the workforce in a manner that encourages and matches growth of Wisconsin companies with well-paying jobs. National employment growth is projected by the BLS to take place in three major areas:

- Executive, administrative, and managerial positions;
- Professional specialty occupations, technicians, and related support positions; and
- Sales and service jobs.

Planning for a strong Wisconsin means that the state must build on its strengths and change to meet the future challenges.

There will be a job growth slowdown for precision, craft, and repair workers; operators and fabricators; and laborers. The Wisconsin workforce composition is contrary to employment predictions from the 1980 census data. Some suggest that Wisconsin should completely transfigure its educational and industrial policy to prepare for an industry based on services. However, I do not think it would be prudent for Wisconsin to neglect its manufacturing production potential. Manufacturing is a major source of national wealth and has been a strength for Wisconsin in the past. It would be devastating for the state to ignore its manufacturing experience and ability to plan for a strong manufacturing base. Planning for a strong Wisconsin means that the state must build on its strengths *and* change to meet the future challenges.

Developing a strong manufacturing future for Wisconsin has several implications:

- The workforce will become more productive.
- Not all manufacturers that produce "commodity" products or poor-quality goods will survive because others will do it cheaper or better--often outside of the U.S.
- Manufacturers who cannot compete internationally will not survive.

Those manufacturers who *do* survive, will probably employ fewer workers. One of the outcomes of increasing productivity is that it creates dislocated workers. While traumatic for individuals, the larger question is whether or not there is an infrastructure around those workers that can help them find and perform other jobs.

The state lost 90,208 jobs that had above average earnings. More than 17,000 jobs were gained that had earnings close to average. Unfortunately, the bulk of jobs gained in Wisconsin between 1979 and 1985 were markedly below average in earnings.

There is not a great deal of current data, but the 1980 census figures provided a picture of the composition of the Wisconsin workforce. As compared to the rest of the nation, Wisconsin (Cibarich, 1986) had:

- Proportionally fewer white collar workers and more farm, services, and blue collar workers than the nation as a whole;
- A smaller proportion of workers in all major white collar categories and a slightly smaller proportion of precision, production, craft, and repair workers;
- Nearly twice the national average of farm, forestry, and fishing workers; and
- A significantly larger proportion of people employed as semi-skilled operatives, fabricators, and unskilled laborers.

These statistics were surprising. Wisconsin has a reputation as a high skill state. Given the future employment trends projected by the U.S. Bureau of Labor Statistics (BLS), Wisconsin workers will need extensive retraining and perhaps, a change in attitude in order to command the good jobs that the economy is creating. In some respects, the state is caught in its own culture. Dairying is considered by some to be superior to other types of farm production, but dairying will not insure a secure economic future like it did in the past. Rethinking is necessary to deemphasize the reliance on dairying and consider other areas for economic vitality.

Changing and upgrading raw agricultural products is one way to enhance Wisconsin's economic future. However, this can be a difficult and traumatic process. If this is not done, many individuals will lose their jobs and their farms. Recently business publications including The Wall Street Journal, reported that Israel had decided to develop a whole new market in the U.S. In 1987, that country will import value-added food such as jelly, breads, pasta, and other products. Test marketing has been positive and this will be Israel's first attempt to diversify into the general U.S. supermarket. The consequences of such action are unknown, but something must be done to help this country rethink its attitude toward preparing for the future and producing these products itself.

Dislocated Workers: Natural Outcome of a Changing State Economy

Dislocated workers have a negative connotation that has developed in the past few years. This attitude must change. In an economy that is highly fluid with high levels of productivity and new businesses emerging and growing, there will be dislocated workers. Those workers need basic skills to move quickly to other jobs and the nation and Wisconsin must help them in that task.

Wisconsin must accept the challenge using its manufacturing experience to grow new companies.

In many areas of the country, particularly in the New England states, dislocated workers have become a tremendous resource. They were the backbone for the formation of the new entrepreneurial businesses that developed in many highly technical areas. Wisconsin has been weak in encouraging entrepreneurial and new businesses, as has the entire Great Lakes region. The area has lagged behind the rest of the nation for about 25 years. Wisconsin must accept the challenge using its manufacturing experience to grow new companies.

My family owns a small flooring company in Winchester, Virginia. Interestingly, some of the intricate cutting of inlayed pieces is done in Sommerset, Wisconsin, at a small laser company. Many of the workers at that company are graduates of Wisconsin's vocational schools. The company is using the "service" of this small manufacturing plant to create a "value-added" product in Virginia. It is a compliment to Wisconsin that this kind of workforce is being trained in the state. Small entrepreneurial companies such as these are vital to the economic future of Wisconsin and the nation. The challenge is to create an atmosphere where such companies can grow.

Wisconsin's Economic Past

All the changes occurring in the workforce have an impact on the earnings of workers and the incomes of their families. One misconception affecting workers is that Wisconsin is a high income state. Several facts dispute this claim:

- Between 1984 and 1985 Wisconsin was one of the bottom 19 states in annual percentage pay increases according to the unemployment insurance data from BLS.
- Annual pay increases in Wisconsin were 3.3 percent during those years. The national average was 4.5 percent.
- Wisconsin ranked 26th in average annual pay and 38th in gross pay; both numbers were lower than Minnesota and Indiana.
- Annual pay in 1985 averaged $17,594 in Wisconsin. The national average was $19,186.

- In state per-capita income, Wisconsin averaged $13,154 while the national average was $13,864. The neighboring states of Illinois, Michigan, and Ohio all had higher per-capita income than Wisconsin.
- The employment growth data for Wisconsin showed a lag compared to the entire U.S. Employment figures for the first quarter of 1986, in terms of percentage increases by each employment sector, revealed that there was only one area in Wisconsin above the national average. That area was finance, insurance, and real estate.
- There was a 13.9 percent real drop in salaries and earnings between the first quarter of 1973 and 1985.

Hopeful people invest in the future.

To believe that Wisconsin is a high income state is a myth and, hopefully, this idea is not being conveyed outside of the state. The Wisconsin Department of Industry, Labor, and Human Relations attempted to explain the reasons that this myth was perpetuated. Only four states in the nation, namely Iowa, Indiana, Michigan and Wisconsin, have a manufacturing sector that is also their highest wage sector. This is one of the reasons that individuals believe Wisconsin manufacturing salaries are high and the state is characterized as a high wage state. If factual workforce data are not known and understood by Wisconsin leaders, future investments and public policy toward manufacturing and the workforce may be skewed in the wrong direction. Wisconsin needs and should pursue high quality manufacturing jobs that pay well. These jobs provide a decent middle-class life for Wisconsin families and give hope for the future. Hopeful people *invest* in the future. If these jobs are not available, Wisconsin will not have the tax base or demand base needed for growth that creates faith in the future.

Public investments in the educational system cannot be made if the tax base cannot afford them. However, the jobs that pay well should reward high-skill, dedication, and growth in worker competence. Mutual investments can be made through the tax base, I believe that two criteria must be met first. One, the percentage of tax must be reasonable, which means that income levels must remain acceptable. Two, taxes should be invested in future-related activities such as education and infrastructure.

Wisconsin's Tax Investments

Wisconsin was sixteenth in the country in terms of per capita taxes in 1985 and this tax money was placed in diverse investments.

Tax Expenditures as Compared with Other States

Tax expenditure	Rank compared to other states
Education	20th
Higher Education	16th
Public Welfare	7th
Hospital Investment	36th
Highways	41st
Police	45th
Interest on debt	24th

Several experts believe that the Midwest will never recover the manufacturing stronghold that it once had. Douglas Booth, economics professor at Marquette University, Milwaukee, Wisconsin, proposed in a Wall Street Journal article that businesses go through cycles and "after a while, industries reach a point where they are more interested in long term security and established patterns." Only through major shifts and reorganizations do "industries and new ways of thinking begin to happen." He felt that, "The Midwest is going through a very long regional cycle and there is some evidence that it is for its own benefit and that it is ready to take off."

Enhancing the Business Environment

A study funded by the American Trust called "Indicators of Economic Capacity" found that workforce expectations for the Great Lakes states may be off base. Businesses that pay highly-skilled people who command high wages are looking for other things than just low labor costs. Cheap labor, land, and taxes were also factors in their location decisions. These businesses must have access to technological capital, a skilled labor force, and the capability to tap technological expertise. This study tabulated 25 criteria to use in judging an area suitable for companies. Among them were:

- Local venture capital;
- University and industry outlays for research and development;
- State spending on education; and
- Degrees in science and engineering.

The New England area ranked highest on these criteria, but the Midwest region ranked second. This was primarily because of the region's traditional investment in education.

Family Income as an Indicator of National Well-Being

The most important social unit in the future of the U.S. is the family with children aged 18 and under. How well the family is doing economically is an important indicator of how the economy is performing for the average American. The Joint Economic Committee of the U.S. Congress commissioned and published a number of studies on the economic status of this group. One of the most important studies, done by Danziger and Gottschalk (1985), reviewed U.S. census statistics on family income. In 1985, the middle 20 percent of families with children in terms of income still had not caught up to the real 1973 income levels of a comparable group. Some blame the decrease in real income or purchasing power on the increase in one parent families, but the same can be found with two parent families.

Earnings of Two Parent Families, 1973, 1979, and 1985

Year	Average earnings
1973	$35,493
1979	$35,383
1985	$35,032

The drop in income from 1973 to 1985 occurred in spite of a great increase in labor participation of women during that period. Neither one parent nor two parent families had made any significant gains over the years.

Increasing economic growth and business development will enhance Wisconsin families' living standard.

Increasing economic growth and business development will enhance Wisconsin families' living standard. Ways to achieve this include:

- Joining public and private resources;
- Examining the education system;
- Rewarding individuals who receive degrees from Wisconsin's higher education institutions and then pay back the state by returning labor and talent;

- Becoming more concerned about core academic skills in the vocational system so that individuals have basic learning skills required for rapid retraining should they become a dislocated worker;
- Understanding the competition--both nationally and internationally;
- Doing a better job in elementary and secondary schools with approximately the same amount of resources by using technology.

Planning to create positive change by the year 2000 is not an unrealistic goal, but one that we must work toward.

A new concept in tying these suggestions together was funded by the U.S. House of Representatives Appropriations Subcommittee on Labor, Health and Human Resources, and passed by the U.S. Congress in fiscal year 1987. The concept is based on connecting two Wisconsin public investments--the educational broadcasting system and the education system's computers. Part of the impetus for this project came from the realization that the educational reform movement has neglected rural areas. Ironically, rural areas in Wisconsin and other states have more computers per 100 students than urban areas. However, these computers are used less, because smaller school districts cannot afford to send teachers to inservice programs and pay for substitute teachers. The need to connect the educational system and technology is obvious. The first experimental program, which is a basic reading program, will be beamed into about 20 northern Wisconsin schools in the fall of 1987. We want to know if students learn to read more quickly using exciting computer programs? Projects like this will not be started in many cases without "venture capital" and some innovative thinking. Experiments are needed throughout Wisconsin in both the private and public sectors. Perhaps one of the most important roles of the public sector, in addition to operating its governmental agencies well, is to encourage and recognize experimentation in the private sector. Whatever is done, the outcome must be long-term rather than short-term. Planning to create positive change by the year 2000 is not an unrealistic goal, but one that we must work toward.

Creating a Better Future

There are several steps that Wisconsin can take to insure a prosperous future beyond the year 2000. Some of these efforts are small, but all are vital to developing a workforce that will make businesses and industries grow. To begin, we must examine industrial trends, but avoid slavishly following them since trends exist in the past and cannot completely predict the future. We are masters of our own destiny. We can decide to invent, transform, stop and walk away, or create. We can decide how to reconfigure a "success ethic" so that it means more than just constantly increasing consumption. We can encourage investment among the state's people and learn more about international markets and competition. By doing these things, Wisconsin will build new strengths.

Existing strengths cannot be forgotten. This state has one of the cleanest governments in the U.S. People take pride in working for the state of Wisconsin, something that is not true with all states. The state has invested in a strong educational tradition over the years.

The "can do" attitude of Wisconsin citizens is exemplary and is, perhaps, Wisconsin's greatest strength.

The "can do" attitude of Wisconsin citizens is exemplary and is, perhaps, Wisconsin's greatest strength. A man I know from Holland made a promising observation of American businesses, "They're so optimistic--they don't know they can fail." I know it is this optimism that will lead us to a secure future.

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Future Demographic and Social Trends

David M. Zach

This paper explores the current demographic and social trends that are likely to influence both work and family in the near future. In so far as these trends will be part of society in general, they will also impact life in the state of Wisconsin.

Marriage and Family in the Future

Many forecasts still suggest that the divorce rate is continuing to rise and that the family is in decline. Remarriages are common; some forecasters even predict that many people will have three marriages--not all at once, but one right after the other. The first time young people will marry for love and romance. They will become bored, distracted, and eventually divorced. Each will remain single for a time and then remarry; this time for producing children. Again, boredom will set in and divorce and singlehood will follow. Finally, the third and last marriage will be for mature companionship.

My grandparents found out about this forecast. Even though they will soon celebrate their 64th wedding anniversary, they are beside themselves, because they cannot imagine where at their age they will find two more spouses.

So much for some forecasts about the future of marriage and the family. The idea of serial marriage is only one vision of the future. It is not going to be the popular vision, even though there are many people who fit that model.

Despite frequent forecasts about the high divorce rate, the rate has stabilized and appears to be declining.

Despite frequent forecasts about the high divorce rate, the rate has stabilized and appears to be declining ("Poll shoots," 1987). Because of the changing world, there is likely to be less divorce in the future. Marriage and family are increasingly favored. Social attitudes, economic forces, and increasing longevity are changing our household patterns. There are more empty nests, where parents are still living even though children have moved away from home. More young people can afford to live on their own than was true years ago. Marriages are delayed. The average age for a man's first marriage is 25.7 years. That is the highest it has ever been ("Rise in," 1986). Women's average age for first-time marriages is 23.1 years--a slight drop from last year. Is this pattern a blip or a trend? It is a statistic that warrants careful examination in the future.

Even if the divorce rate drops, there is still a serious problem with the rising number of single parent families. In 1984, there were 275,000 out-of-wedlock births to women under the age of 20--a 300 percent increase over 1960 levels.

Even in light of these statistics, the family does seem to be more popular today. In 1986 there was an increase of 420,000 new families, of a husband and wife with children ("Kidding around," 1986). Those families most likely, were smaller and many of them were also blended families, the result of previous divorces. There is a good chance that more marriages will occur in the future as marriage continues to catch up with younger baby boomers.

AIDS: A Threat to the Future

Any discussion of social or demographic trends must include the consequences of Acquired Immune Deficiency Syndrome (AIDS). Here are three alarming statistics about this crisis:

- The Chicago City Health Commissioner currently estimated that between 1 out of every 60 to 100 people in that city are infected with the AIDS virus.
- For the city of New York, it is estimated that 1 out of every 15 individuals is infected or 1 out of every 10 adults in that city ("New York," 1987).
- Scientists estimated that once infected with the AIDS virus, a person's chances of coming down with AIDS is greater in the second 5 years than in the first 5 years after infection ("Map of," 1987).

Some of the possible resulting trends from the actual disease of AIDS along with the fear of AIDS, include: more people getting married at younger ages and staying married, a dramatic drop in the divorce rate, and an increase in the birth rate. There could also be a backlash for anything liberal or nontraditional, adding to the country's growing power of conservatives and fundamentalists.

Elder Population Grows in Numbers and Influence

Elders in our society, people 65 and over, now out number and out vote teenagers.

Elders in our society, people 65 and over, now out number and out vote teenagers. There are 29 million people over the age of 65 today. By the year 2000 there will be 35 million and by the year 2025 there will be 56 million elder Americans. These people are relatively healthy. Only 6.5 percent of people aged 65 to 84 are in nursing homes today. That number rises to 21 percent for those over age 84.

Retirement is becoming a choice with many different options. Increasingly, people are choosing early retirement while, at the same time, others are refusing to retire. More people are retiring gradually, evidenced by an increasing demand for part-time, flexible job opportunities for the elderly. McDonald's for instance, sees the elder market as a virtually untapped workforce. Older individuals have special needs, but they also have special skills and maturity.

Elders are reshaping the education system both with the desire to learn and to teach.

Elders are reshaping the education system both with the desire to learn and to teach. A normal 65-year-old American can expect to live another 18 years on the average, and an 85-year-old American can expect to live another 6 years. This suggests that these individuals have many more productive years to offer. Questions to be raised, however, are: What will an aging society be like? How will the elderly use their growing political power? Will the baby boomers who were a force for change in the 1960s and 1970s be a force for conservatism in the 2020s and 2030s of the next century?

Our population is getting older. The medium age for people in our society today is 32 years. By the year 2000 it will be 36 and by the year 2025, the medium age will be 40. How will this affect workforce and societal trends in the future?

Work and Family are Changing

The landscape for work and the family is changing.

- Sixty percent of working husbands have working wives.
- Women today receive 50 percent of the bachelor's degrees, 53 percent of the master degrees, and 37 percent of the PhD's.
- Forty-four percent of mayors and city council members of U.S. western cities with 500,000 or more in population are women.
- Thirty percent of similar positions in eastern cities of 1 million or more are held by women.
- Fourteen percent of all city offices in the U.S. are held by women.
- In 1986, The Wall Street Journal (Advertisement, 1986) gave student business awards to 850 business students in U.S. colleges. Of those receiving awards, 561 were women.

Husbands will begin to push for the same things their wives are pushing for now.

Workers Demand More Individual Rights. Women's influence in the work place will increase as more baby boomers marry and have children. Marriage is increasingly seen as a partnership, and husbands will begin to push for the same things their wives are pushing for now. Corporations will have to respond to demands for family-related benefits, flexible schedules, parental leaves, and job sharing. There may even be a rise in the number of professional part-time positions due to the realization that even at a professional level, there is still a need for part-time work.

Rising to the top of the corporate ladder is becoming less important.

Success Does Not Necessarily Mean Rising to the Top. Both men and women are redefining success in personal terms. A good standard of living is now expected. People want personal growth and self development from their jobs and a role in decision making. Rising to the top of the corporate ladder is becoming less important. Family life is often favored over work life. The most compelling reason for these attitudinal changes is that more jobs are requiring people to have education and independent thought: It is a package deal.

Entrepreneurs: Key to Success. Entrepreneurs are creating the future.

- In the 1950s there were about 93,000 new businesses started every year. Today over 12,000 are started each week.
- There were 669,000 new businesses started in 1985. Not all survived, but in 1982, for every business that failed, 20 new ones began.
- One third of these new businesses were started by women.

Entrepreneurs are the new heroes on the college campus. We used to worry about students blowing up buildings; now, we worry about students buying the buildings.

Entrepreneurism is growing because of a rapidly disappearing loyalty in corporations.

Entrepreneurism is growing because of a rapidly disappearing loyalty in corporations. Loyalty disappears in the face of so many white collar layoffs in recent years. The Wall Street Journal ("More managers," 1986) reported that 35 percent of middle management jobs faced layoffs since 1981. There are also signs of a mid-career squeeze, with fewer advancement opportunities.

Education and Automation

"How does education fit into an increasingly automated world?"

An important question that we must ask today is, "How does education fit into an increasingly automated world?" John Naisbitt (1982), author of Megatrends, said that white collar jobs are hit more by automation than blue collar jobs. That means that all workers are vulnerable to automation. It means that office workers are just as vulnerable as factory workers. The impact of today's automation is more individual than it used to be. Often it does not automate jobs as much as it automates the tasks within those jobs. In turn, as task after task becomes automated, the individuals doing those tasks gradually become outdated.

For instance, how will education respond to voice-activated typewriters in the future? Wang and IBM are currently developing these typewriters that will type as a person speaks. They are expected to be on the market by the early 1990s. How does this change the need to know how to spell? This typewriter may even be able to translate languages. A machine that is spoken to in English will have the capacity to translate and type in German, Spanish, or any other language. Will there be as great of a need to teach languages in the future, if a machine will instantly do translation? If these machines facilitate cross cultural contacts, we may not need to teach languages, but we will need to teach far more courses on different cultures.

What happens when Japan, and eventually the U.S. automate their housing industry? Housing construction is being done in modular fashion, using robotic assembly lines. A computer will soon be more important for housing construction than a hammer.

What happens when a $30 software package allows people to write wills that are legal in 49 states? How will the education of a lawyer or paralegal change with that fact? How do those individuals working in law offices identify their skills that cannot be eliminated?

Automation increases the need for education. It has been estimated that for every dollar spent on workplace automation, another dollar needs to be spent for training to provide efficient use of equipment. It is currently estimated that only 15 cents on the dollar is spent for education. This means that there are many computers posing as expensive paperweights in today's offices.

In the future, education will not be a right. It will be a responsibility.

The key to employment for any worker will be to become a life-long learner. In the future, education will not be a right. It will be a responsibility. Those who continue to learn will have the power and the jobs in the future; those who do not, will find themselves outdated and occupationally obsolete. The future belongs to those who are not afraid to learn and change with the times.

The question is not, "Will education be automated?" but, "How much will not be automated?"

Education is not immune to automation. The question is not, "Will education be automated?" but, "How much will not be automated?" Toys are at the forefront of automating education. There are now machines that read words in special books at the touch of a child's finger. This is automated education. Teddy Ruxpin and many other stuffed animals can talk via taped messages. There is even a doll on the market called Baby Grace that gives pro-life messages. A new television program is expected soon that is called, "Tech Force and the Moto Monsters." For $250 you can buy the spaceship that accompanies the program and responds to an electronic signal sent over the screen. The toy interacts with the program. Could a show like Sesame Street use this signal technology with a Teddy Ruxpin-type stuffed animal? As children learn to count, Teddy could count with the child. This takes basic education out of the classroom and into the nursery.

Videocassette recorders (VCRs) are also automating education. Jane Fonda teaches people to exercise in their own homes, while Julia Child has an entire series of tapes on the "how-to's" of cooking for children and adults. There are over 50 different videotapes on the market to improve a person's golf game. Northwestern Mutual Life Insurance Company produced almost 50 different video training tapes last year in all aspects of the life insurance business.

The interactive encyclopedia is a teaching tool coming on to the market that will impact jobs tremendously. By using small compact disks, like those now used for music, about 250,000 pages of information can be stored on a single 5-inch disk. Three companies are developing a version of an interactive encyclopedia. Modeled after the Encyclopedia Britanica, it will have color, moving pictures, and stereo sound. These three companies are: Apple Computers, National Geographic, and Lucasfilms (the company that produced "Star Wars"). This could blow education, as we know it, right out of the water.

Steven Jobs, the man who developed the Apple Macintosh computer, is developing a new computer call "NeXT," which he refers to as a scholar workstation. The NeXT company estimates that this computer can simulate the mechanics of a human body or the structure of a DNA molecule. It will also be able to teach musical composition to non-musicians. Most importantly, the company believes that the NeXT computer will come the closest to replicating one-to-one tutoring.

What Cannot be Automated?

Because of automation, computers, and flexibility of job choice, 80 percent of a person's job can be done by someone else or by a computer.

That raises the final question of, "How much will not be automated?" Here, the "New 80/20 Law" applies. Because of automation, computers, and flexibility of job choice, 80 percent of a person's job can be done by someone else or by a computer. If workers want to remain employed in the future and vitally involved, they will have to determine what their unique 20 percent will be. In other words, what is there about a person that cannot be automated?

A person's "20 percent" contains such skills as:

- Ability to continually learn;
- Ability to solve problems;
- Skills of imagination, intuition, and creativity;
- Ability to adapt to change; and
- Ability to communicate.

Communications skills for the future go beyond just writing and speaking.

Communications skills for the future go beyond just writing and speaking. They include listening, interpreting, presenting, and probably most importantly, negotiating. There is a growing need to negotiate between different ideas, different cultures, and between the past and the future.

The future depends on how we use our unique 20 percent that cannot be automated. I suggest we better pay attention to this list of skills and teach them well.

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SUMMARY OF PRESENTATIONS ON THE IMPACT OF DEMOGRAPHIC TRENDS ON THE FUTURE OF WORK AND THE FAMILY

National Perspective

Speaker: Ronald E. Kutscher

There is a population growth rate disparity between developed and developing countries. Since 1945, population has grown less than half as fast in developed as in developing countries. This disparity is expected to continue, although both rates will slow, so that more than 90 percent of the population growth between 1987 and 2000 will occur in developing countries.

During the 1970s, the U.S. economy absorbed the baby boom generation into the labor force. To hold unemployment steady, the U.S. had to add 3 million jobs annually. From the 1980s to the mid-1990s, labor force growth will be slower than in the past due to post-baby boom reductions in birth rates. To hold unemployment steady, only 1.3 million jobs are needed. The population slowdown will affect the age distribution of the work force. Young workers comprised a significant proportion of the labor force in the 1970s. After 1978, their proportion began to decline. By 1995, there will be 3.5 million fewer 16 to 24-year-olds in the labor force than today, as well as 1.5 million fewer people over age 55 in the labor force, primarily due to early retirement. Since 1980, blacks, Hispanics, and females have constituted almost 90 percent of labor force growth, and this trend will continue into the 1990s.

More than 90 percent of U.S. jobs were added to the service sector between 1970 and 1985 and this trend is expected to continue. The most rapid growth has been in wholesale and retail trade. The dramatic growth experienced in business services, professional services, and medical services will continue. Only modest employment growth is expected in construction through the mid-1990s. Employment is expected to decline in mining and agriculture into the 1990s. Manufacturing employment is expected to stabilize. In general, an increase in the skill content of the workforce is expected.

Over the last 10 years, 45 percent of job growth was in professional, managerial, and technical level jobs. Future employment in these occupations will continue to increase with most employees requiring postsecondary training. Employment in sales and service occupations will also increase at a fast rate. Farm workers, private household workers, and operatives and fabricators have declined and are expected to continue to have lower than average employment growth. In general, there will be an increase in the share of jobs in higher skilled categories and a decrease in the lower skilled categories. People with postsecondary education will face better employment prospects than those with less education. On average, the unemployment rate for college graduates is 2.2 percent compared to 20 percent for high school dropouts. Educational opportunities must be provided for those minority groups who will be over-represented in the U.S. labor force but are least prepared for work. The educational system must ensure that people are not sent into the work force without the basic building blocks necessary to learn new jobs: The ability to learn, knowledge of the English language, as well as reasoning, problem solving, communications, math, and science skills.

State Perspective

Speakers: Dena G. Stoner and David M. Zach

Changes in the family structure were discussed, with an emphasis on the increased age of marriages, the smaller number of families, and the corporate response to female labor force participation in the form of flex-time, job-sharing, etc. The relationship between automation and education were delineated. For every dollar spent on workforce automation, another needs to be spent on education, compared to the 15 cents per dollar now spent. Eighty percent of what one does can be done by someone or something else; the future depends on what one does with their remaining 20 percent.

CRITICAL ASSUMPTIONS AND ISSUES RELEVANT TO DEMOGRAPHIC TRENDS

Assumption

Adult illiteracy and school dropout rates will remain high.

Issues

Should minimum standards for basic skills be established by the state or by districts for enrollment in all vocational or technical programs?

How can VTAE schools ensure that all students have the core competencies necessary for employment and everyday life?

Assumption

The U.S. and Wisconsin must adapt to an international economy and world trade in order to maintain a good standard of living for its citizens.

Issue

How can the VTAE system or individual districts respond to global markets and prepare students to understand and function in an international economy?

Assumption

Small businesses will continue to employ a majority of workers and create most of the new jobs in the U.S. and Wisconsin.

Issue

How should the VTAE system respond to increasing entrepreneurship and the formation and maintenance of small businesses?

Assumption

Minority and other special populations will continue to increase.

Issue

To what extent should special services and programs be provided by the VTAE system for the increasing numbers of special population students?

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THE FUTURE OF WORKING
WISCONSIN

Our Economic Future

We as a nation still have the best tools, people, and resources in the world. However, we must learn about, appreciate, and compete in the entire world much more effectively than we are today. If we do, the effect of international business on Wisconsin's future and our lives, will be bright and beneficial.

John M. Shank, Jr.
World Venture Management, Inc.

Our Changing Economy: How Today's Policies Affect Tomorrow's Future

Congressman David R. Obey

During the 40 years since World War II, Americans have generally looked at the world economy as an issue of concern for humanitarian and political reasons. The U.S. was not only the dominate economy in the world, but to a very great extent, a self-sufficient one. While poverty in Latin America or economic reversals in Europe might have meant greater political opportunities for our adversaries, they appeared to have little direct effect or impact on the well-being and living standards of American families.

While much of the same kind of thinking still persists about economic events beyond our own borders today, it is no longer a reality. The face of America in the 1980s has been reshaped by events in world market, and the way we have dealt with them in both the private and public sectors. Those changes were not readily apparent early in this decade, but now they are unmistakable. America has really developed two economies during the 1980s.

America's Two Economic Climates

America has done extremely well in this decade.

The economy in California and along the Atlantic coast has been dominated by service industries such as banking, communications, advertising, and international trade and also aided immensely by government defense procurement and research intensive industries such as semiconductors. That part of America has done extremely well in this decade. It has grown by more than 4 percent a year--a pace similar to that experienced by the entire country in the prosperous 1960s. In those regions, real family income grew at a hefty rate, so did wages and the number of good paying jobs. It is little wonder that the national press corps, which is headquartered in New York, Washington, and Los Angeles, has bought the Reagan Administration's line about "morning in America."

But in other parts of the country, stretching from the steel mills of Pennsylvania, through the farms and factories in Wisconsin, to the forests of Oregon and Washington, and the oil fields of Louisiana, it has not been "morning in America." In the remaining 34 states, the 1980s bore no resemblance to the boom periods of the 1960s. Family income was falling during this decade; jobs in manufacturing were evaporating; and real wages were declining. Farmers were faced with an abrupt deterioration of markets as farm prices fell, profits vanished, and debt expanded at an unprecedented rate.

From 1981 to 1985, more than two-thirds of the nation's growth was concentrated on the East Coast and in California, an area that contained only about 40 percent of the nation's population.

From 1981 to 1985, more than two-thirds of the nation's growth was concentrated on the East Coast and in California, an area that contained only about 40 percent of the nation's population. The remainder of the country, containing nearly 6 out of every 10 Americans, got only one-third of the nation's growth during that period.

A study (Bluestone & Harrisonn, 1986) which I released as chairman of the Joint Economic Committee of the U.S. Congress, analyzed wage trends in the U.S. from 1973 to 1979 and again from 1979 to 1984. The study (Bluestone & Harrisonn, 1986) also examined wage and employment trends by region. The Midwest region, which includes Wisconsin and 10 other states ranging from Ohio to North Dakota, actually lost jobs between 1979 and 1984, while the number of jobs nationwide grew by more than 8 million during that period. The last 2 years have brightened that picture somewhat, but only slightly.

The study (Bluestone and Harrisonn, 1986) showed an even more stark trend in the types of jobs held by those Midwesterners. More than 1 in 6 jobs paying above $28,000 disappeared during those 5 years. The overall decline in jobs remained relatively small in that region, however, because the disappearance of good paying jobs was largely offset by the creation of almost a million new jobs that paid less than $7,000 a year in 1984 dollars. The number of Midwesterners working for real annual wages of less than $7,000 grew by more than 10 percent during the first half of the 1980s, and the region not only lost jobs, but traded large numbers of good paying jobs for ones that paid very little. Again, 1985 and 1986 have marginally improved that picture, but the regional differences remain.

Why this disparity? Why are Midwestern and other noncoastal states suddenly doing so much more poorly than California and the Atlantic coast? This trend was not apparent during the 1970s or the 1960s. There is no single characterization of the 34 states in that heartland region that provides an answer; their demographics are different. Some lead the nation in agricultural production, others in manufacturing, and still others in energy. Let's look at agriculture for a moment.

Agricultural Downturn

In 1981, 20 states accounted for well over 90 percent of all farm income. All of the top 10 states and 17 of the top 20, in terms of farm income, were heartland states. Almost all of those states experienced dramatic downturns in income derived from farming between 1981 and 1985. In 8 of the 20 states, real farm income dropped by more than one-third and in 14, it dropped by more than one-fifth. Why?

Despite the slight but steady increase in U.S. food consumption, American farmers overall are producing less.

While surpluses are clearly a problem, in most areas of agriculture, surpluses do not come from increased U.S. capacity or output. I come from a dairy district and dairy has a somewhat different set of problems, but in fact, despite the slight but steady increase in U.S. food consumption, American farmers overall are producing less. Total volume output as measured by the U.S. Department of Agriculture actually fell by more than 4 percent between 1981 and 1986, while U.S. food consumption in real dollars rose by more than 5 percent. Feed grain production in the U.S. fell by 16 percent from 1981 to 1985 and then dropped by another 10 percent in 1986.

But take a look at imports. From 1977 to 1981, farm exports grew by more than 10 percent in terms of volume and 20 percent a year in dollar value. Since 1981, we have lost about 25 percent of our total level of export sales measured both in volume and in dollar terms.

Energy states have also suffered. In the eight states most dependent upon oil and gas from personal income, unemployment rose by more than 40 percent between November 1981 and November 1986, the most recent date for which state unemployment numbers are available.

Manufacturing Decline

But our biggest problem was manufacturing. Wisconsin's economy has taken a bigger clobbering than most states because manufacturing has been more important in this state than elsewhere. That brings us again to the overall problem for the heartland. If all of the states in this country had grown at the same pace between 1981 and 1985, the 34 heartland states would have had $60 billion more in annual income in 1985 and the bicoastal states would have had $60 billion less. Three-fifths (or $36 billion) of that heartland shortfall income was concentrated in six of the nation's largest manufacturing states: Wisconsin, Illinois, Indiana, Michigan, Ohio, and Pennsylvania.

In all 50 states, manufacturing income represented a declining portion of total state income.

Not all manufacturing states did badly, but those that did, attributed their problems directly to their manufacturing sectors. In Pennsylvania, income from manufacturing dropped by 15 percent. In Illinois, it dropped by more than 10 percent. Wisconsin, Indiana, and Ohio all experienced a drop of manufacturing income of more than 4 percent. Again, the last 2 years have improved the situation somewhat, but those regional differences still remain. Some states experienced a growth in real manufacturing income, but in all 50 states, manufacturing income represented a declining portion of total state income.

There are a variety of factors that have affected U.S. manufacturing. Gains in productivity have allowed producers to maintain volume while cutting employment and labor costs. But the economic growth of any nation depends on sectors such as manufacturing doing more than just maintaining volume.

During the 1980s U.S. consumption, like the economy, has continued to grow at a healthy rate of almost 4 percent while production has lagged at a weak rate of about 2.5 percent. That difference has been made up by imports, and for the most part, imports of manufactured goods. In 1981, the U.S. had never run a trade deficit in manufactured goods; in 1986 that deficit was an astounding $140 billion.

Some deterioration can be accounted for by factors totally beyond our control. Change is the natural part of economic life. Even the Japanese are now failing to compete in certain low-end consumer electronics, such as black and white televisions. They have already given up on manufacturing many types of steel. Products that are labor intensive and can be produced with modest amounts of capital and technology are inevitably going to be produced to a large degree in low-wage countries.

Many of the quality building programs, which laid the foundation for Japan becoming the industrial giant it is today, were invented in this country by Americans and were often ignored for 20 years or more by the companies that paid for their creation.

Industry's Responsibilities. Changes in demographics, business cycles, technology, or cultural values all play their role. But much of our decline, in my judgement, has been a matter of bad policy in both private and public sectors. For example, many of the quality building programs, which laid the foundation for Japan becoming the industrial giant it is today, were invented in this country by

Americans and were often ignored for 20 years or more by the companies that paid for their creation. The failure of U.S. industry to recognize the commercial importance of new technologies, such as front-wheel drive automobiles and the video cassette recorder, are well documented.

After all, it is the private sector where most economic decisions are made about management techniques, investments, quality standards, and research. It was not government that for 10 years declined to produce small cars to compete with Japanese quality and mileage when the energy crunch hit in the 1970s--it was Detroit. It was not government that decided that an ever-increasing percentage of chief executive officers (CEOs) in American business corporations would know more about their corporation's financial management than about actual product production. That happened in the private sector--not in government.

The problems that led to our trade deficit are in a very large part the result of government's misbegotten or nonexistent policy.

Government's Responsibility. But, while government did not make those decisions, it did in a sense partially create the environment in which those decisions were made. So it was an equal partner in the problems that developed. And without letting the private sector off the hook one bit for its arrogance or its complacency in the 1960s and 1970s, the fact is the problems that led to our trade deficit are in a very large part the result of government's misbegotten or nonexistent policy, and I would say that is especially true in the 1980s.

Even the failure of corporate executives to think strategically about the long-term well-being of their enterprises is in part a product of not trying to construct public policies that will promote growth. For example, our banking and financial system leaves a heavy hand in corporate finance up to the managers of pension funds. The continued employment of technicians who manage those funds is determined in a large part by the quarterly balance report of those funds. The laws affecting pension funds do not have to encourage "Quick-Draw-MacGraw" management and movement of those funds, but they do.

Public policy has a much more direct and measurable impact on our trade deficit. Perhaps the most profound shift in U.S. public policy in this generation was the famous tax cut of 1981. It was designed, according to its promoters, to encourage savings and investment, to encourage productivity gains, and to increase the competitiveness of American products. It did none of those things.

Look at the numbers, don't look at your biases, prejudices, or political philosophy. Simply look at the numbers and see what happened to productivity, savings, and investment over the last 6 years. The tax cut of 1981 shot the U.S. federal deficit through the roof, raised real interest rates on U.S. debt, and sucked in hundreds of billions of dollars in foreign capital causing the dollar to rise on world currency exchanges.

Rather than recognizing the problem for the devastating blow that it was to American farmers and American manufacturing sectors in states like Wisconsin, our government bragged about the high-priced dollar, claimed that it represented a vote of confidence in our program, and argued that intervention would represent a disruption in the market, and would be detrimental to the U.S. and world economies.

Rather than recognizing the problem for the devastating blow that it was to American farmers and American manufacturing sectors in states like Wisconsin, our government bragged about the high-priced dollar, claimed that it represented a vote of confidence in our program, and argued that intervention would represent a disruption in the market, and would be detrimental to the U.S. and world economies. That silly chatter sent the dollar even higher, representing a 40 to 50 percent tariff on U.S. made products for exports that we ourselves imposed, and a 40 to 50 percent subsidy to foreign imports for which we were also largely responsible because of our federal budget policies.

By the time U.S. Treasury Secretary Baker took over and had an opportunity to reverse that self-emasculation, whole industries had grown up in Japan, Europe, and Latin America based around the idea of the noncompetitive dollar. The Europeans had been major grain importers at the beginning of this decade; by 1986 European farms had moved into the gap created by the overpriced dollar to become surplus producers. The Japanese seized immediately on the opportunities presented by that uncompetitive dollar to strengthen strategic industries that had previously not been able to compete against American producers on world markets. They were already pulling abreast of us, I would say, in a field like electronics, but with the added currency edge they enjoyed phenomenal growth in semiconductors and developed sales networks that allowed them to launch a devastating attack on American products worldwide.

The government allowed the overinflated dollar to choke U.S. manufacturing until last year. Dogmatic government inaction and noninvolvement in other areas as well, crippled American policy. While the Japanese used tariffs, quotas, and a variety of other restraints to restrict the access of American products to the Japanese markets, we allowed their imports into the U.S. to more than double in real dollar terms. One could probably count the dozen, well publicized, supposedly "successful" meetings between U.S. and Japanese officials during the last 5 years that actually resulted in a net real dollar decrease in the value of U.S. exports to Japan. In the meantime, something as mundane as toilet paper manufactured in northern Wisconsin still sells in Tokyo stores for more than $5 a package, or more than twice the price of the same package in Hong Kong.

One of the least well understood policy blunders affecting American manufacturing and agriculture has been the manner in which we have dealt with Latin American debt.

The Latin American Debt. One of the least well understood policy blunders affecting American manufacturing and agriculture has been the manner in which we have dealt with Latin American debt. While most Americans realize that Latin American countries have been big borrowers, very few realize that they have been equally big buyers. Furthermore, Latins have had a strong preference and attachment for American made products. They have been large importers of American agricultural products, and they have been the single, biggest, foreign market for a whole range of capital goods, many of which are made in Wisconsin.

United States Treasury Secretary Baker deserves credit for reversing the Reagan Administration's earlier misbegotten policies on currency, but his timidity on the problem of Latin American debt is becoming almost as disturbing as his predecessor's intransigence on currency values. Since 1983, the U.S. has fostered policies that have rightfully protected the solvency of American financial institutions to whom those loans were made. But they have done so in a way that is totally unbalanced and has provided a windfall to money center banks in this country at the expense of virtually every other sector of the U.S. economy.

We should want those debts repaid to those American banks, but not in such a way that they disadvantage the manufacturing and economic sectors of the American economy and cost us jobs.

In simple terms, what is happening today is that Latins would like to spend more money to purchase excavators from companies like J.I. Case in Wisconsin, but instead that money is being heavily used at the direction of U.S. policymakers to make interest payments to U.S. money center banks. Public funds have been used to underwrite those payments while all but two of the money center banks have experienced rising profits and dramatic increases in stock values. Recent reports in The Wall Street Journal indicate that some Latin loans have become the most profitable in bank portfolios. We should want those debts repaid to those American banks, but not in such a way that they disadvantage the manufacturing and economic sectors of the American economy and cost us jobs. This is the way the Latin American debt problem is being managed today, and it is costing Americans thousands of jobs.

Future Investments. Finally, as most business leaders are well aware, the competitiveness of American industry is dependent upon two kinds of investments, not just one. Workers need the best tools and the best technology we can put in their hands, and it is largely up to private capital markets to raise the funds to provide those tools. But there are a range of critical improvements and critical investments that private capital simply cannot provide the funds for. They cannot adequately raise the funds needed for roads, or for bridges and harbors, which are needed to move American made products and the materials needed to make them. They cannot raise sufficient funds to finance the nation's schools, universities, and technical schools. They cannot adequately fund the level of basic research needed to create new industries in areas such as gene splicing, laser technology, or microprocessing. Those all have to come about because of investments by government, at least to a very large degree.

There is widespread concern in this country, and I must say I share it, about inadequate levels of private investment. But I think that very few people really appreciate the dramatic drop in public investment we have experienced at the federal level during the last 6 years. Let's take a look at the federal budget.

The Federal Budget

In 1980, retirement programs, including Social Security and Medicare, represented about 40 percent of federal spending. Increased numbers of elderly people and the rapid pace of inflation in health care have been accommodated through selected program cuts. The result has been that real dollars, at least the share of the federal budget that goes to senior citizen programs, have remained fairly constant--about 40 percent. Defense spending, however, has grown from about 23 percent of the budget in 1980 to more than 29 percent today. Because that came at the same time we had large tax cuts, interest payments in the percentage of the federal budget have grown from 9 percent in 1980 to 14 percent today. How did we accommodate that increase in defense spending and that increase in interest payments?

Support of vocational training has been cut in real dollar terms and so has aid to elementary and secondary schools. This year President Reagan's budget calls for abolition of all federal support for vocational education.

We did it to some degree by cutting programs for the poor. In 1980 programs for the nonelderly poor made up about 7 percent of the budget; today they make up about 5.5 percent. But for the most part, aside from the huge deficit we ran up to accommodate the increase in military spending, we compensated, at least to a degree, for those increases by reducing our investment in infrastructure and reducing our investment in civilian science. As a result, most families today can no longer qualify for the full amount that government programs provide, like student loans. Grants and fellowships have dropped dramatically, and students are graduating with much heavier debt burdens than they have before. Support of vocational training has been cut in real dollar terms and so has aid to elementary and secondary schools. This year President Reagan's budget calls for abolition of all federal support for vocational education. Highways, sewer construction, and safe air travel have also paid a price. Civilian research and development continued to be cut until just last year.

Cutting most domestic programs simply made possible the huge increase we had in military spending over the past 10 years.

In 1980, 78 percent of the federal budget was spent on defense, interest, the elderly, and the poor. The remaining 22 percent funded essentially two kinds of programs. It contained the money that was needed simply to keep the government running--the money to pay for the Internal Revenue Service (IRS), to pay for the U.S. Customs Service, to keep our prisons going--just to keep government mechanically working and keep the doors open. But the largest portion of the 22 percent is what I call the investment portion of the budget. It is what we invest in people by way of education and in science by way of basic research in everything ranging from technology change to health research at the National Institute of Health (NIH) on diseases such as cancer and AIDS. It represents everything that we have invested in community infrastructure so that communities remain decent places where people can make a living, and where businesses can make a profit. That portion, that investment portion, of the federal budget has declined from 21 percent of the budget in 1980 to 14 percent today, and the Reagan Administration has repeatedly asked that we cut it to 10 percent. That has not been done in order to cut overall federal spending, because during that time overall federal spending actually grew. Cutting most domestic programs simply made possible the huge increase we had in military spending over the past 10 years.

Wisconsin has fewer defense industries than any other state in the nation on a percent basis, and that means that we receive a smaller share of the resources allocated to that portion of the budget than any other state. But some people will say that we had to spend the money on defense because domestic social programs were breaking the bank; we had to strengthen our defense pocket. Let's look at the numbers--let's not look at Dave Obey's numbers--let's look at the Congressional Budget Office's numbers.

What the Numbers Really Show. The Congressional Budget Office is an independent budgeting traffic cop set up by the White House and by the U.S. Congress. The budget office looks at the numbers the White House and the U.S. Congress produce, and says, "O.K., here's what those numbers really mean." And I will tell you what they show.

Incidentally, the Congressional Budget Office is headed by Rudy Penner, a Republican economist, not by any left-wing Democrat trying to "embarrass" the Reagan Administration.

Penner's numbers show that in 1962, before we ever heard of Lyndon Johnson's "great society" programs, we devoted 4.2 percent of our gross national product (GNP) to what is known as domestic discretionary programs. By 1980 that had risen to about 5.8 percent of GNP. Today, that is back down to 4.1 percent lower than it was when we began Johnson's great society programs. If the budget was placed on automatic pilot and not a single policy was changed, by 1991 the percentage of GNP spent on those programs would decline to 3.7 percent. President Reagan's budget would take that down to 2.7 percent --about 40 percent below pre-Johnson levels. Where did the money for domestic discretionary programs go?

We had this tremendous switch in priorities to finance a buildup to counter a Soviet military buildup that certainly never took place, at least to the degree we have been told for the previous decade.

We were told for the last 10 years that the Soviet Union was increasing its defense spending in real terms by about 8 to 10 percent a year above inflation. The Defense Intelligence Agency (DIA) told us that, along with the Central Intelligence Agency (CIA). Well, a funny thing happened on the way to that switch in priorities. Two years ago, the CIA and DIA came to the Joint Economic Committee of the U.S. Congress, and said, "We were wrong. The Soviets haven't been increasing their defense budget by 8 to 10 percent in real terms, they were increasing it over that period by about 2 percent a year in real dollar terms." Their defense procurement was up by about 1 percent during that period and most of that went for items that they were pouring into the Afghanistan war. So we had this tremendous switch in priorities to finance a buildup to counter a Soviet military buildup that certainly never took place, at least to the degree we have been told for the previous decade. That does not mean that the Soviets have not modernized their military forces; *they have*. But they have done it within the context of a virtual freeze in procurement up until about 2 or 3 years ago. There is a lesson in that somewhere if we just think about it.

In addition to increased defense spending since 1980, the Reagan Administration has been asking us to provide gigantic increases in foreign military assistance. Grant military assistance--that's the stuff given to other countries, not lent to them. Grant military assistance since 1980, has increased in the budget by 590 percent and the Reagan Administration's budget this year would increase that by another 110 percent. Last year for the first time in its history, the U.S. Office of Management and Budget (OMB) threatened to veto an appropriation bill, my bill, the foreign aid bill that I brought out of my committee because it did not spend enough money. This was the first time in the history of the U.S. Congress that has ever happened. And yet we are being asked to take a $6.5 billion cut in education this year, including the elimination of federal support for vocational education.

I held two days of hearings on Pacific-Rim economies in December 1986. We were told by at least half the witnesses who addressed the committee that by the year 2010, Japan will be the number one economic power in the world. For people who fought in World War II, that is a rather different economic outcome than this society expected in 1945. I don't know if those predictions are right or not. I think there are a lot of things that could change it, but does anybody really think that we can afford to allow the Japanese worker to become the best educated with the best trained workforce in the world and still maintain our competitive edge? If they do, they have a better understanding of the workings of the world economy than I do. Do they think that will help the trade deficit and put our own economic house in order?

Few people realize just how far we have to turn the trade deficit around and how deep a hole we are in now.

Rapidly Rising Trade Deficit. Some people are now saying that our trade deficit has improved; the numbers are starting to go down so we really do not have to worry about it; and the problem will go away. I think we ought to take a closer look at those numbers, because few people realize just how far we have to turn that trade deficit around and how deep a hole we are in now. Every business person knows that balance sheets have to do just what their name implies; they have to eventually balance. When you import more than you produce, you pay for the excess imports either out of savings or with borrowed money. Keep in mind I am not talking about the federal debt here because that could be financed totally by a privately held nest of savings. What I am talking about is money borrowed by all sectors of the economy to pay for the trade deficit. Follow these numbers, this is complicated and very few people understand it, but *until* we understand it, we will not understand how far we have to go if we are really not going to run up a trillion dollar international debt by the end of this century.

At the beginning of the 1980s, this country had built up the largest net asset position in its history. The rest of the world owed us about $140 billion more than we owed them. By 1985 that entire sum had vanished. At the end of 1985 our net foreign debt was more than $100 billion, and today it is $250 billion.

What if the trade deficit begins to shrink? Won't our debt position improve? The answer is probably not. A dramatic improvement in the trade deficit this year would be about a $40 billion improvement. That would still leave us with a deficit of about $100 billion and would, therefore, still add $100 billion to our overall foreign debt even though our trade balance improved slightly and the deficit decreased slightly. The trade deficit would be going down but not what we owed to the rest of the world. Furthermore, a debt that size has tremendous interest rate implications. A rapid improvement in our trade balance would be unlikely to leave the U.S. with a trade surplus anytime until well into the 1990s, even under the most optimist assumptions.

By the time we get to the mid-1990s, U.S. foreign debt will easily exceed $500 billion dollars--or more than double its current level.

What does that mean? By the time we get to the mid-1990s, U.S. foreign debt will easily exceed $500 billion dollars--or more than double its current level. At 8 percent, interest payments on a debt of that size would be approximately $40 billion a year. That means that any year in the 1990s the U.S. did not run a trade surplus of at least $40 billion, our overall foreign debt would still be growing. In other words, a $40 billion trade surplus is the level of annual export earnings the U.S. would sustain simply to service the foreign debt we are now compiling. That is based on a rosy scenario about the speed with which we could turn our trade deficit around.

If we improve at a slower rate, and most people think that will be the case, our present trade situation will push our foreign debt rapidly toward the $1 trillion mark and beyond. That is a higher ratio of debt service to export earnings than the majority of so-called debtor nations of Latin America have had, and that is the direction we are headed if we do not change the policy.

But what of the regional disparities mentioned earlier? Won't California and the East Coast continue to prosper with flourishing service industries even though those of us in the Midwest will face tough times? I don't think so. I think our service industry is largely built on the wealth generated by our manufacturing and farm sectors. Services are important, and they offer a great deal that Americans are obviously enthusiastic to buy, but where do we get the money that makes banking and other financial services possible?

At the beginning of this decade the Japanese had only one of the top eight banks in the world; today they have six. In my opinion, that is not necessarily an indication of the skills of Japanese bankers, but rather an indication of the impact a successful manufacturing sector can have on the service industries. And I would expect the inverse would also be true. So that means all Americans from all parts of the country and all walks of life need to focus on what they can do to produce and export goods and services to reduce the present spiral. We need to expect and get more from corporate board rooms, from union halls, and halls of learning. But we must also understand that public policy plays a critical role and is an area where great improvement is needed.

That is why it is crucial that Washington policymakers set ideology aside. We need to stop asking what public policies make us philosophically comfortable or fit our philosopic biases, and ask simply what will work. We desperately need a summit between the White House and the U.S. Congress to put together a budget compromise for spending and revenue, and to put together a trade package to add to the currency agreement, which the Reagan Administration finally began to work out because of U.S. Treasury Secretary Baker in mid-February. Without it, this country economically will continue to drift with tremendous consequences for future generations.

We Must Act Now to Build a Better Future

In 1960 when I graduated from college, Jack Kennedy was about to be elected president. Then the average 30-year-old, 10 years after leaving the family nest, was making 20 to 25 percent more than his or her father made when he began work. Today, 30-year-old workers, 10 years after leaving the family nest, are making 10 percent less than their parents did when they first started work. Those are 2-year-old numbers that began to improve somewhat, but still the apparent trend has been dramatically in the wrong direction.

Real family income since 1973 has been stagnant. This country has always been built on the idea that with our energy, imagination, and effort, somehow things are always going to be better for the next generation. I don't know what will happen if over the next 10 or 15 years family income remains stagnant in real dollar terms. But I do think that if we lose that sense of optimism, if we lose that expectation that things are always going to be better for our children than they were for us, we will lose something critical to America's leadership ever since this country first hit the map, and that is something we simply cannot afford to see happen.

If we do not face the fact that we are shifting responsibilities for our present-day gutlessness to future generations, we will have an economy that grows more slowly and provides fewer high paying jobs.

I am neither an optimist or a pessimist--I am a realist. But I just have to think that if the American public understood the cost of this neglect today; the cost of this temporary convenience of spending much more than we take in, both as an economy and as a government; and the future consequences, they would insist on the kind of compromise that I suggest take place at the national level. States can do anything they want to compete with each other. Vocational education, higher education, and elementary and secondary education can do anything they want within their resources to teach children, but in the end, if we do not face the fact that we are shifting responsibilities for our present-day gutlessness to future generations, we will have an economy that grows more slowly and provides fewer high paying jobs than we have been used to.

We were told just a few years ago, for instance, "Don't worry about the manufacturing sector, high tech is going to take care of it all." This year we suffered a $3 billion trade deficit in high tech items so even the new winners in this society, because of our trade situation, have been losers. This situation must turn around, and anybody who cares about this country's future will not allow the continuing impasse on budget policies to put our manufacturing sector at a permanent disadvantage.

You may see the trade deficit come down somewhat. But, a prolonged set of conditions with the overvalued dollar, which partly resulted from the budget deficit, has allowed other countries to penetrate markets that were U.S. dominated. We may regain some of those markets, but we will not regain them all. We suffered a permanent loss in some of those markets. The question is, "Will we act in time to retrieve as much of those markets as we can over the next 25 years? That is the question we face at the public level! It is the question we face in the private sector! And it is one of the questions that we all need to think about!

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International Business in Wisconsin's Future
Our Benefit?
Our Detriment?

John M. Shank, Jr.

The world beyond Wisconsin is becoming more difficult to ignore. Each day we receive a barrage of information ranging from reports on the hostage situation in Lebanon to the economic realities that the U.S. automobile industry must face. The international political situation can be ignored by turning off the television and not reading the newspaper, but the international business situation cannot. It both hurts and helps our pocketbook daily. How can we in Wisconsin deal in this real world? What does the future have in store for this state? Will the future international business situation benefit or hurt us? I am an optimist and think it will help us greatly as it has so far, but I am not sure.

Protectionism is Hurting Us

The debates on protectionism are raging on both a national and statewide basis, and the attitude that prevails in the nation will be very significant for the future of Wisconsin. This attitude will determine if international trade will be a benefit or detriment to the state. Protectionism will not work. It did not work in the 1930s and was a contributing factor to World War II. Today, because of improved communication and travel, a resurgence of the 1930s-type of protectionism would be disastrous.

Protectionism is hurting all of us each and everyday.

Protectionism is hurting all of us each and everyday. Daniel Oliver, chairman of the Federal Trade Commission (FTC), said that trade restrictions cost Americans $50 billion a year in higher prices ("FTC chief," 1987). For example, in the automobile industry, it costs automobile buyers $200,000 per year for each job saved. This is hardly a bargain considering the average auto manufacturing job pays only $40,000 per year. Furthermore, these trade restrictions are not saving jobs. Federal Trade Commission economists ("FTC chief," 1987) have found no correlation between unemployment and rising imports.

Oliver ("FTC chief," 1987), said it was essential to allow the U.S. economy to restructure itself and "protectionism merely slows down the process and makes it more painful for everyone."

This is happening in Japan as well. The Japanese openly admit that they are protecting their rice farmers because of a longstanding cultural fear of the outside world. They do not want their primary food supply held hostage and used as leverage against them. This is an outdated feeling since the Japanese are far more vulnerable as a society to having their oil supply cut off. This protectionist measure costs the Japanese household a great deal. Japanese consumers will have to pay 10 times more than we do for rice, and rice is a primary part of their diet.

Tariffs designed to protect jobs have a way of coming around from unusual directions and hurting us.

Tariffs designed to protect jobs have a way of coming around from unusual directions and hurting us. For example, if we apply a tariff on iron and steel castings to protect our foundry and auto workers, China would cut back on their recent significantly-increased corn purchases and hurt our farmers. China purchased more than 840,000 metric tons of corn this past year, and the outlook is for an even better year next year.

The U.S. sugar industry is protected with price supports and the price (about 21.7 cents per pound) is roughly triple the price on the world market. This directly benefits U.S. cane, beet, and corn farmers, but costs the consumer an extra $3 billion annually. This goes directly against the much publicized Caribbean Basin Initiative because much sugar is produced in that region. Also, it has hurt U.S. business persons. Since 1981 five sugar refiners, representing about one third of our country's capacity, have had to close due to a lack of competitive raw material. This has cost over 7,000 jobs.

However, there is a more ominous political ramification of this. The Dominican Republic, a major sugar producer, had to seek other markets for its sugar. They ended up selling more than 150,000 tons of sugar to Russia at over 8 cents per pound. The Soviet Union paid a higher than market price to deliberately try to extend their influence beyond the neighboring island of Cuba. In fact, last year the Soviet Union's sugar purchases from the region were nearly three-fourths of the U.S. purchases (Lawrence, 1987).

Is this form of protectionism really helping us? Is it helping the Wisconsin corn farmer? What are we to do? Continue protecting the industries with the most political clout and allow others to loose their business to foreign competition. *Definitely not!*

How Do We Become More Competitive?

Low-labor cost countries make competition much tougher, but take a moment to consider that the country that is giving us the most difficulty is Japan, and their wages are now almost as high as ours.

A lot has been said recently about American industry's need to become more competitive. This is easy to say, but hard to do, when one considers that the average Korean is paid 1,251 won an hour or $1.41; the Taiwanese, 58.91 New Taiwan dollars per hour or $1.48; and the Hong Kong citizen, $1.75 per hour ("U.S. manufacturing," 1987). These wages make competition much tougher, but take a moment to consider that the country that is giving us the most difficulty is Japan, and their wages are now almost as high as ours.

Decrease Labor Intensity. What should be done? Movement away from labor intensive products or producing these products in countries with low-labor costs is one solution. This has been done quite successfully by many major companies in Wisconsin. Badger Meter, Johnson Control, Allen-Bradley, and General Electric all produce products in Mexico and other countries with low-labor costs. This has not resulted in jobs lost in Wisconsin, but has enabled those companies to remain competitive in the world marketplace and develop more higher paying jobs in Wisconsin. Don't think for a moment that the Japanese haven't seen this as well. They have over a dozen factories in the border areas of Mexico, and Matsushita Electric (Panasonic) has started producing stereos and radio pagers for the American market (Bequillard, 1987).

We Must Automate. Automation is an old word that has connoted job loss to workers since the beginning of the industrial revolution. Even though automation may cause some job loss, I feel Wisconsin should go one step further in developing our base in the machine tool industry and position in electronics. We should produce the automation machines and microprocessor-controlled robots utilizing our highly-skilled labor. We will also be producing a product that can demand a selling price to support high priced labor.

Promoting a protective tariff is easy for a politician to do and wins votes. Removing a tariff is much riskier.

Government's Role. What should the government do? Government has an important role in keeping the business playing field level. The battle against protectionist barriers is unending. Promoting a protective tariff is easy for a politician to do and wins votes. Removing a tariff is much riskier. Our politicians cannot demand that foreign countries, as Lee Iacocca suggested, remove their barriers and export to the U.S. more than they import. This is because we have tariffs and barriers that are just as frustrating to foreigners as their barriers are to us.

Flexibility is Essential. There are many other issues to consider. For example, the American Society for Testing and Materials (ASTM), has developed standards for boiler designs. These were imposed long ago to protect us, the users. However, the Japanese claim, and with a great deal of merit, that these standards are out of date with today's materials. They have been unable to persuade the ASTM to change its standards and therefore have been unable to export their more efficient boilers to the U.S. The result is less competition and higher priced boilers for our houses, apartments, and businesses. We pay higher fuel costs, because we cannot take advantage of the highly-efficient Japanese units.

We Must Help Ourselves. What should we do? Vincent Siew (1987), director general of the Taiwan Board of Foreign Trade, has urged U.S. business persons to do more to help themselves. Siew (1987) said we should: "Step up market research and intensify sales promotion to make the best of market opportunities." Siew (1987) continued by saying, "We strongly believe the best way to improve the trade balance is for us to increase our imports from the U.S. rather than restrict our exports." I agree and feel that this is a healthy attitude.

The U.S. must get out of the shrinking, but comfortable, domestic market and engage in competitive selling with the rest of the world.

The U.S. must get out of the shrinking, but comfortable, domestic market and engage in competitive selling with the rest of the world. To quote Wisconsin's Governor Tommy Thompson ("The Greening of Wisconsin's International Trade" conference, February 2, 1987), "International trade represents a golden opportunity for Wisconsin companies to expand their market base and remain competitive." Thompson continued by saying, "There are more than 1,000 small state businesses that could be exporting and are not." Bruno Mauer ("The Greening of Wisconsin's International Trade" conference, February 2, 1987), secretary of the Wisconsin Department of Development, stressed that the first thing that needs to be said is that international trade is very important. International trade is not something for the elite few. It is not only a concern of big business. All of us are affected by international trade. For example, 50,100 jobs or 1 out of every 10 jobs in Wisconsin's high-wage manufacturing sector are export related. However, Wisconsin ranks only 37th among all states in terms of the percentage of state manufacturing output that is exported. *Clearly, more needs to be done!*

Let's Build on Our Assets

Our open, free society provides the fertile soil needed for creative minds to develop new ideas, new products, and better ways to do things.

The resources of our state and country are great--the best in the world--and we must utilize them. We have a labor force with superior technical skills. We can still pour higher quality castings of exotic metals than any other country. They may be able to copy our high technology, but they cannot copy our technical skills. We have an efficient and effective telephone system. Our infrastructure of roads, highways, waterways, and airports is efficient, quick, and effective. For example, we can move coal and soda ash from Wyoming and be competitive in Japan. We always complain, but we do have one of the most efficient and honest postal systems in the world. Checks have to be hand delivered in the Dominican Republic, or they will be stolen. We have an excellent banking system with prompt and efficient check clearing. Most of all, our open, free society provides the fertile soil needed for creative minds to develop new ideas, new products, and better ways to do things. This is the best country in the world for the entrepreneur to get started and either get rich or go broke.

The Japanese are not infallible. In the $5 billion Baoshan steel project in China, the Chinese are building the most modern mill in the world. They had to drop their Japanese partners after reports of friction and allegations that Japan was supplying less than state-of-the-art equipment (Bangsberg, 1987).

Much is said about the quality of life in Wisconsin, and I am a strong believer that this is important not only from the selfish living standard viewpoint, but from the morale viewpoint as well. A happy person, a person not jammed in a tiny apartment in Tokyo, is a more creative, effective person.

Developing a Worldwide Attitude

We need to develop a worldwide attitude.

How do we take advantage of our resources and capitalize on our competition's mistakes? We need to develop a worldwide attitude. It is up to educators to expand our horizons. They must educate the next generation and enlighten the present one. Europeans have always been traders, and the Japanese have learned with a vengeance since World War II. We have to compensate for the advantage the Danes have, for example. If a different language were spoken in Illinois, we would know it as the Danes know German, and we would naturally be trading over an international border.

Learning a foreign language is key to developing a worldwide attitude. European business persons all know at least two languages, and the Japanese are feverishly studying English. We all should know a least one language other than our own, and it does not really matter which one. The experience of learning, and even slight knowledge of another language, allows one to empathize with the poor foreigner struggling in English. All this builds confidence for functioning efficiently outside our culture.

We have to keep up the good work in technical education. Grant Thornton Accountants and Management Consultants (1986), rated Wisconsin number two in vocational education enrollment in the nation. This is essential to keep and build the skilled labor pool so vitally needed.

We should pay more attention to international current events, and our newspapers must become far more internationally oriented. The New York Times and The Journal of Commerce are two examples that give complete international news.

We must be flexible in our business attitudes. For example, in California's Silicon Valley, James Solomon (1987) developed a computerized process to help speed up computer chip design. His concept was a success, but his best customers turned out to be the Japanese. We must learn and be flexible enough to take advantage of our own breakthroughs.

Most of all, we need a winning attitude--an attitude like John Stollenwerk's of Allen-Edmonds Shoe Corporation. Stollenwerk did the right thing when he grabbed the bull by the horns and went directly to the problem in Japan. He used an enlightened approach, worked their culture to his advantage, and came away with their respect and a great deal of profitable Japanese business.

We as a nation still have the best tools, people, and resources in the world. However we must learn about, appreciate, and compete in the entire world much more effectively than we are today. If we do, the effect of international business on Wisconsin's future and our lives, will be bright and beneficial.

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Wisconsin's Economy in the Global Marketplace

This text was edited from a presentation by Ayse Somersan at "The Future of Working Wisconsin" conference.

There have been some fundamental changes in the world economy that have affected Wisconsin's economy. The state's goods-producing sector and increasingly, parts of the service-producing sector have been and continue to be restructured along the same lines as the global restructuring that has developed over many years.

Peter Drucker (1986), a well-known management expert, recently wrote about the world economy. This paper will be organized around Drucker's (1986) three major points about the "changed" world economy. In the article he (Drucker, 1986) mentioned that people are talking and complaining about the changing world economy. To paraphrase, Drucker (1986) said, "Forget the word *changing*. It has already *changed*. What we need to do is figure out how we are going to adjust our thinking to that."

Drucker's (1986) three major points outline both the problems and the opportunities facing us now and in the future. Each are summarized and related to the world, national, and state economy.

Primary Goods Sector--Uncoupled from the Industrial Economy

Drucker's (1986) first point was that the primary goods economy has become uncoupled--separated--from the industrial economy. For example, the collapse of raw material and agricultural prices that started in 1977 has basically had little impact on the world industrial economy. The depressed state of the primary goods sector has not caused a similar depression in the industrial economy. Thirty or 40 years ago that sort of relationship would not have existed. But times have changed, and there has been a separation between the fortunes of these two broadly-defined sectors.

The economics of both Wisconsin and the U.S. have been growing at a fantastic record for over 4 years and yet, pockets of unemployment and immense financial strain still exist in both economies.

The economics of both Wisconsin and the U.S. have been growing at a fantastic record for over 4 years and yet, pockets of unemployment and immense financial strain still exist in both economies. The production of forest products, metals, minerals, and agricultural products increased despite falling prices. The major contributors to this change have been a geographic restructuring of food production around the world and the use of declining quantities of raw materials to produce the same level of output throughout the past 80 years.

Production Uncoupled from Employment in the Industrial Economy

In all industrial countries, manufacturing production has more or less maintained its share of total output. Manufacturing is as important now as it was in the past, but employs fewer people each year. Look at countries that have tried to preserve blue collar employment at the expense of international competitiveness. They have basically laid the foundation for greater future unemployment. Britain is an excellent example of a country that has tried to buck that tide and suffered because of it.

In terms of national direction, policies that are designed to maintain and increase output must be separated from policies that are designed to increase employment. There has been a great deal of talk about the deindustrialization of the U.S. economy. Drucker (1986) contends that it is not the U.S. economy that is being deindustrialized, but rather the U.S. labor force.

Since the 1950s, almost the entire growth in the labor force has been accommodated by increasing jobs in the broadly-defined service sector.

This trend is not new; it has been going on for a long time. Since the 1950s, almost the entire growth in the labor force has been accommodated by increasing jobs in the broadly-defined service sector. For the recent past and the foreseeable future, any increases in the value of manufacturing output have been and will continue to be accompanied by declining blue collar employment. The change in the production function will continue.

Other countries are experiencing the same changes in an even more dramatic fashion. Think about the butcher metaphors that have entered our language; "lean and mean," "cutting to the bone," and similar kinds of meat metaphors. Most of that cost cutting has come through a realignment of the workforce that is needed to produce the output. The trend appears irreversible at this point if countries are to successfully engage in international competition.

All of this restructuring in the world and U.S. economy has affected Wisconsin as well. Over the last 14 years, according to a Wisconsin Department of Development report (1986), more than 97 percent of the state's new jobs have been in the service industries. That trend will continue for Wisconsin and the nation.

Wisconsin has a large stake in maintaining the competitiveness of its manufacturing businesses.

Wisconsin derives over 20 percent of its personal income from manufacturing employment. This is approximately 5 percentage points higher than that of the nation. Because of this, Wisconsin has a large stake in maintaining the competitiveness of its manufacturing businesses, which can be done in the following ways:

- Assisting manufacturing businesses to incorporate the latest technologies as they modernize plantroom equipment;
- Assisting workers who have lost jobs that will not come back with retraining, relocation, or other types of assistance;
- Rethinking the philosophy of production in Wisconsin; and
- In order for Wisconsin to compete internationally, the state must explore creating new versions of old products. High-priced, highly-skilled workers can be used to produce these products. High technology components of total products must also be considered. Increasingly, manufacturers will not start from scratch and turn out finished products at one location. The components will come from all over the world, as they do now. The nation and Wisconsin will have to determine the components markets in which we will have a competitive advantage, so that jobs can be created that will be needed in the year 2000.

What are the preconditions for an above average growth in Wisconsin's service industries? For example, consistently promoting tourism, over the next several years should help maintain Wisconsin's competitive position vis-à-vis other states. However, if the state relies on the tourism industry to create increasing numbers of jobs, then the quality of the plant from which those jobs are produced must be assessed. Wisconsin tourism is serving visitors who can move anywhere in the world, and who are looking to visit multi-activity facilities anywhere in the world. Our nice cool weather in the summer, beautiful trees, and water, alone, will not attract tourists. Creative public and private strategies must be developed to upgrade the quality of our offerings.

We need to work with smaller communities in the state to provide jointly-used facilities for local people and visitors so that our undependable weather creates less of an uncertainty for the net income expectations of small business operators, especially in the rural areas. We might also focus attention on the importance of star attractions. Star attractions, not in the sense of a Disney World or a Great America, but star attractions that capitalize on the state's resource base and recreational activities, and that will attract large numbers of visitors and conventioneers to relatively remote areas. There has not been a star attraction in northern Wisconsin since the 1930s with the exception of Telemark, which is now closed. Visitors will not come to Wisconsin just because it is a wonderful place to visit; facilities and services must be offered in order for the state to be successful with tourism.

Wisconsin must also focus attention on other service businesses. Those with the largest export potential, either to Illinois or to Taiwan, must be identified. Policies must be developed that will help those businesses grow and thrive in Wisconsin. We must look beyond the existing jobs and enact public policy that can help these businesses establish export markets.

Economic growth occurs because dollars earned outside the state are spent inside its boundaries.

All of these changes in the state's employment structure have been accompanied by changes in personal income distribution. As expected, personal income from goods-producing industries has declined, while personal income from service-producing industries has remained stable. But that is not where the dramatic news has been. The excitement has been in passive income growth. Passive income includes transfer payments, rent, interest, and dividends. In Wisconsin, one out of three dollars in personal income is in the form of passive, or unearned income. Most of these dollars are controlled by older individuals. It would be helpful to focus some attention on the types of changes, both in terms of the state's tax structures and the services provided, that would make this group of individuals want to spend their retirement years in Wisconsin. It is not the weather that will attract senior citizens. Economic growth occurs because dollars earned outside the state are spent inside its boundaries. Money that comes into the state, such as through retirement checks, has a multiplier effect. It creates jobs. Attention must be paid to the services Wisconsin can provide to this sector.

Capital Movements--Driving Force of the World Economy

Capital movements, rather than trade, have become the driving force behind the world economy. Figures indicate that world trade is greater larger now than ever before. It has been growing on the average of 6 to 7 percent per year for the last 30 years. But, it is the symbol economy--the economy of capital flows, foreign exchange transactions, and credit transactions--that is now the driving force. On an average day, for each $1.00 of trade flows, there are $25.00 of capital flows. In a sense, each business in the nation engaged in national trade must function as two businesses; one, a maker of goods or provider of services, and two, a financial business operating in the world market.

Dollar appreciation during the first half of the 1980s cost us dearly in Wisconsin and in the nation in terms of markets and jobs. Currently, we are in the opposite end of the cycle. The decline in the dollar's value, while not as great as it sounds at first for all kinds of reasons, has certainly created some relief especially in this part of the state. However, we are basically buying time. We are buying time to restructure, rethink, and remarket areas that have been lost. But, this too, shall change.

Thinking globally and acting locally appears to be the message.

We are living in a world with very large capital flows, uncoordinated macroeconomic policies among the industrial countries, and floating exchange rates. As a result, the dollar's value has been and will be more variable from day to day, week to week, and year to year. All of the business planning that is being done now must take into account that sometime in the future, the dollar will appreciate again and the uncompetitive effects of that change will fall upon us one more time. Business planning, as well as local and state economic development planning, need to be done with an understanding of the fundamental changes in the fabric of the world economy. Thinking globally and acting locally appears to be the message. Any undertaking in terms of a public effort will be more successful if it strengthens the international competitive position of Wisconsin businesses.

Preparing for the Future

The future of work in Wisconsin will depend upon the activities in the world and national economy. It will also depend on the policies of the state of Wisconsin. I see several different policies emerging, some of which have been enacted and others that must be considered in the future. These include:

- A transition policy that, instead of fighting change, allows those who have been affected by change to make a less painful transition;
- An economic development policy that focuses attention on technology infusion into old-line industries;
- Another aspect of economic development policy targeting a select number of service industries and trying to devise strategies to help them expand in Wisconsin; and

- Policies that are aimed at encouraging "growing one's own,"--entrepreneurship type policies that increase new business starts.

Back in the 1970s, forecasters who looked at work and economic growth in the northeastern part of this nation did not accurately project the kind of renaissance that has been taking place in Massachusetts and several of the surrounding states. We are in an accelerated transition in Wisconsin. A number of the changes in the fabric of the world economy have hit us more than the average state for many reasons, but mostly because we are dependent on certain key industries. Only time and appropriate policies will help us adjust.

We must put our knowledge and efforts to work in looking ahead to the jobs in the year 2000 and work at preparing for them instead of looking back and worrying about preserving the jobs that existed in the 1950s. If we do that, future generations will *want* to live in this state because of its quality of life. And they will be provided with the opportunity to do so because the jobs will be here.

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The Changing American Economy: Some Perspectives and Comments

This test was edited from a presentation by Clare W. Zempel at "The Future of Working Wisconsin" conference.

There is a current obsession that we in America seem to have about competitiveness--an obsession that must surely amuse many people abroad. Consider this. We are in our fifth year of what I think will turn out to be rather solid economic growth. Not economic growth that solves all problems, but certainly a much more sanguine environment than an outright recession.

Economists have become progressively more optimistic about economic prospects in 1987.

In fact, one of the things that I suspected would happen, has happened. That is, economists have become progressively more optimistic about economic prospects in 1987. The National Association of Business Economists recently raised its 1987 forecast sharply, reflecting much greater optimism about near-term economic growth.

We no longer have a serious inflation problem. There is suspicion that inflation will rise this year, but not to a crisis level. Millions of new jobs have been created in the last several years. Yes, some of those jobs are lower paying than we might prefer, but nonetheless the jobs are there. A recent article in The New York Times stands in stark contrast to the book edited by U.S. Congressman David Obey (1986). In the article, U.S. Commissioner of Statistics Janet Norwood, pointed out how careful one should be with all economic data. She said that the rise in the number of people in so-called low paying jobs is largely attributable to the last recession--the one that ended in 1982. There has already been a significant decline in that number and a concomitant shift toward higher-paying jobs. It must be remembered that many issues that obsess us now and most cited in Obey's (1986) book, are very likely to prove cyclical (i.e., ephemeral) in nature and will disappear. In contrast, there are other issues that we ought to be much more concerned about than we are at present. This paper will identify some of those issues.

Trade, Competitiveness, and the Economy

The trade deficit is an issue often discussed in various news publications. Last year it reached $186 million. It is something that is directly linked to our huge, federal budget deficit. However, it symptomizes slow-moving politics more than it does an intrinsically uncompetitive economic system.

Washington is awash these days with schemes that are supposed to improve America's economic performance, but they will, unfortunately and in many cases, do the exact opposite. Two such schemes are the democratic leaders' recent promise to trade unionists to protect them against imports, and President Reagan's 1,000-page plan designed to put American business back on top.

Competitiveness, I am afraid, is turning out to be a big cloak that covers few good proposals.

Competitiveness, I am afraid, is turning out to be a big cloak that covers few good proposals. One of the good proposals is to develop a national data base for patents. Bad ones include protection against foreign competition for those industries that have been losing workers because the industries have become more efficient and need less labor. Such protectionism discourages those changes, which are imperative if these industries are to survive in the long run.

What is really happening here? Why all this concern now? Three broad responses come to mind:

1. Not all of America is growing;
2. Unfamiliarity breeds fear; and
3. Bad economic policies are being implemented.

For many Americans, an economy that helps only some people, some of the time, is just not good enough.

Not All of America is Growing. Many Americans know that not all of our country has shared in the tremendous economic expansion since 1982. It is tremendous in terms of the number of jobs created and economic growth percentages. While overall growth has occurred, certain sectors have suffered. In particular, agricultural areas, energy-dependent areas, and states and towns dependent on manufacturing goods used in those industries, or dependent on manufacturing goods that compete directly with imports, are not doing all that well. Other areas have been horribly resistant to any improvement in the chronic poverty problem. For many Americans, an economy that helps only some people, some of the time, is just not good enough. I tend to agree in spirit.

Unfamiliarity Breeds Fear. American's are confronting some unfamiliar economic circumstances, and unfamiliarity always seems to breed fear and resentment. Our long-run economic history is really one of an economy that has spanned a continent behind high tariff walls. For many decades, American producers needed to do no more than satisfy the demands and tastes that existed in their huge domestic markets. But all that has indeed changed as foreigners have learned to sell goods to us, and as we have learned to love their products.

If Americans were ordered to stop buying foreign goods in accord with all the protectionist pleas that are being sounded, real purchasing power or real income would fall about 20 percent.

Bad Economic Policies are being Implemented. Fear, resentment, and good intentions, combined perhaps with our normal impatience, are breeding some very bad economic policies. Indeed, some solutions being touted under the competitiveness rhetoric are distressingly un-American. It is one thing to hope that Washington policymakers will lead a national campaign intended to raise educational standards. That is needed whether the economy is strong or not. But for Americans to beg for policymakers' help against foreigners is misconceived at best. If Americans were ordered to stop buying foreign goods in accord with all the protectionist pleas that are being sounded, real purchasing power or real income would fall about 20 percent. That is the tax that we would pay to support obsolete industries, unproductive workers, and ineffective, sloppy managers. And paying such a high tax would do absolutely nothing but postpone the inevitable adjustments, and lower our living standards further over time. So protectionism is something to be avoided at virtually any cost.

What Can Be Done?

There are some things that can be done. Some of the following involve inaction, but at times inaction is appropriate:

1. Be patient;
2. On any and all economic issues, sort the causes with care;
3. Reduce the federal deficit; and
4. Locally reduce Wisconsin taxes.

Be Patient. The first thing we need to do is be patient a bit longer. It is always tempting to conclude that the world has changed in some fundamental fashion, but it is usually wrong to do so. At this moment, we are standing at a point in time about 2 years down the road from a significant peak of the dollar's value in the international exchange. The dollar peaked in February or early March 1985 and has since declined. That is a significant decline and one that is beginning to produce the logical consequence in international trade and investment: The trade balance is swinging in our favor.

Sorting Causes. We have little difficulty spotting economic problems, but we often fail to adequately assess the causes. The wasteful result is that we often treat symptoms, leaving the underlying disease untouched, and sometimes causing additional complications.

Agriculture is a good example, in part because it has been in a severe and obvious depression. There is no precise definition for depression, but if there were, today's agriculture would fit. Agriculture's problems came about partially because technological advances in the area have made it possible to grow more with fewer people and farms. More politically, agriculture's depression was affected by embargoes on grain shipments to the Soviet Union, imposed several times in the early 1970s. These embargoes on wheat shipments created a powerful incentive in two directions: one, for the Soviet Union to find a more reliable trading partner, and two, for another country to become that trading partner. In this case, South America became the breadbasket to the Soviet Union--a role that we had almost exclusively to ourselves.

Could this have been predicted? *Yes, in broad general terms.* Whenever we attack a particular problem, there will be ramifications. Many of them will not be pleasant; some of them may be surprising and unpleasant. Do we correct them with yet another action of some sort? It can be a vicious circle, if we are not careful in anticipating the feedbacks in these complex circular processes.

In addition, the steel and automobile industries have benefited from protectionism of some sort, as did the American textile industry, for a long time. What happened when those protective measures were in place? *Virtually nothing.* The industries did nothing to become more efficient or to improve their product designs. The workers did nothing to prepare themselves for the eventual loss of employment, when their industry proved too fragile to withstand the changing world economic forces.

Under the surface, decisions were made on faulty information and wrong signals, and the economic fiber became progressively weaker.

Inflation also affected agriculture and the steel and automobile industries. Inflation became sort of a social disease because it seemed to be a comfortable way of solving and papering-over economic problems. Under the surface, decisions were made on faulty information and wrong signals, and the economic fiber became progressively weaker.

The point is that the problems in agriculture, exports, and other economic areas, are as much due to lower inflation and to bad bets predicated on sustained high inflation late in the 1970s and early 1980s, as they are to broad secular changes in employment and international competition.

Reduce the Federal Deficit. We need to reduce the federal budget deficit. It is this deficit, by contributing to the huge demand for credit in this country, that keeps interest rates high and the dollar higher than would otherwise be the case. The solution to the problem though, is certainly not to raise taxes. It makes no effective difference whether the budget deficit is financed by raising taxes or by selling bonds to the public, domestic or foreign. The money is in essence, still siphoned away from the private sector, which needs it to build the capital to develop new technologies and support new capital investments--two activities that are imperative to creating lasting jobs.

As an economist with two children, I am concerned about their future and the effect that the deficit will have on that future.

This is a case of there being no free lunch and there is no way around it. As an economist with two children, I am concerned about their future and the effect that the deficit will have on that future. I liken the federal budget deficit to a glacier, something we in Wisconsin have more familiarity with than some other people in the country. The glacier is moving across the economic structure, pulverizing much that lies underneath it. Yet it is quiet and therefore, remains largely unnoticed. We are growing tired of budget deficit rhetoric, but nonetheless, the deficit is continuing to inexorably damage the economic structure--just like the glacier "damaged" or transformed the terrain as it moved across Wisconsin. I do not believe that when the deficit recedes, the results will be as beautiful as the glacier's effects.

Reduce Wisconsin Taxes. Wisconsin needs to move steadily toward reducing the overall tax burden imposed on citizens and businesses. It is not enough to take some rather smug satisfaction at times in having a relatively low business tax rate, because who runs the businesses? People. People who as business managers and owners pay a high personal tax rate. One cannot separate, as much as some politicians have tried, the tax burden on individuals and on businesses. We need to keep reducing the tax burden. Other states like Massachusetts have found that by doing so, they became the stars in their economic region within 3 to 7 years.

If there is any hope of seeing Wisconsin once again grow as fast as the nation, let alone re-earn the title "star of the snowbelt," it must be based on using the sole lever under our control. The tax burden must be reduced and that means near-term spending restraints (Wisconsin cannot have budget deficits like the federal government).

Economic's Affect on Education

It is tragic that teaching and learning stops when a person leaves school.

I have always had an intense interest in education--not just formal education, but education within business to retrain workers. I feel that it is a terrible shame that some people still are encouraged to believe that they can leave high school or college, work for a company for 30 or 40 years, earn a relatively high wage, receive many benefits, and retire in comfort. It is tragic that teaching and learning stops when a person leaves school. Can individuals learn more than how to hang a door on a car? Skills such as this do not transfer well within the new emerging economic system. They are eminently replaceable with machines and/or foreign labor and they severely limit human performance and potential.

As an idealist, I feel that we should graduate people with basic skills in reading, writing, numeracy, and operacy (the ability to think effectively).

As an idealist, I feel that we should graduate people with basic skills in reading, writing, numeracy, and operacy (the ability to think effectively). In contrast, we are all victims of a Western tradition in intellectual thought that is turning out to have some serious problems. This educational tradition is really anticreative. It stems from the church's history, where its challenge was to make sure no heretics could survive or flourish. One result is that we are conditioned in school to get ahead by demolishing others' ideas.

That is how we became uncreative. Individuals may receive good grades but be totally uncreative in their professional lives. There is no correlation between academic success and creativity. The mavericks, like Einstein and others, have been the ones to make great creative leaps that enrich our lives and society. Fortunately, there are ways to preserve this much needed tradition.

For example, we must make sure that everyone is given a genuine, classical, liberal education. Anything other than that is antidemocratic. I do not mean to condemn specific skill training. Skill training is fine, *if* individuals also receive a sound liberal education. Unfortunately this is not happening.

Individuals must have the ability and desire to learn all their lives.

We also need to help people become lifelong learners. Because as soon as they prepare for a job in the next emerging industry, that industry will begin to change. Individuals must have the ability and desire to learn all their lives.

Lastly, I want to emphasize the importance of humane and human arts like integrity, ethics, and self-esteem. I recently taught economics to 9 and 10-year-olds in a special program. My goal was to teach decision making and the necessity of making choices. So, I created a sophomoric model of an island economy with Robinson Crusoe (RC) on one end and Jackie Robinson (JR) on the other. (Not terribly creative, but remember I'm a product of the Western civilization too!) RC and JR hated each other, because each thought that the other caused the shipwreck, but each had resources or skills that the other needed to survive.

I asked this group of bright children how they thought these characters managed to survive for 5 years? The answer I wanted was that RC and JR learned to trade with each other to their mutual benefit. The answer I got was that they stole from each other. Needless to say, I found their response troubling. I am not sure whether the children gave me a trivial response to a trivial problem or whether they saw nothing wrong with thievery. I fear the latter. Since these children are, I assert, inherently benevolent, the only plausible reason for their response is ignorance. No one bothered to expose them to ethical values.

Without integrity, we have little, even if we have jobs. Along with job skills and a liberal education, we must teach ethics.

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SUMMARY OF PRESENTATIONS ON OUR ECONOMIC FUTURE

National Perspective

Speaker: David R. Obey

The problems in today's economy are not well understood. However, an understanding is necessary before a solution can be effective. The U.S. economy is comprised of two economies--California with the Atlantic coastal states and the rest of the country. California's economy is dominated by services and aided by government defense expenditures; real family income, wages, and the number of well-paying jobs have grown rapidly. In the rest of the country, family income, the number of manufacturing jobs, and agricultural markets have deteriorated. The Midwest, for instance, lost jobs between 1979 and 1984 while the U.S. gained more than 8 million jobs.

Many of the states in the rest of the country were adversely affected by changes in agriculture and manufacturing. Twenty states accounted for more than 90 percent of farm income in 1981, with the ten top ranking states being heartland states. Over the 1981 to 1985 period, farm exports and income declined substantially. Since 1981, the U.S. lost more than 25 percent of its export sales in volume and dollar terms.

Changes in manufacturing have had a negative effect on employment and income in Wisconsin, a state with a greater than average share of employment manufacturing. Ill-devised policies in both the private and public sectors were largely responsible for manufacturing trade deficit growth from nothing in 1981 to $146 billion in 1986. In 1980, the U.S. had the largest net trade surplus in history. By the end of 1985, net foreign debt grew to more than $140 billion, which has tremendous interest rate implications. Under optimistic assumptions, it is likely that U.S. debt may reach more than half a trillion dollars by the 1990s. The U.S. would have to maintain a trade surplus of at least $40 billion each year to service the debt in the 1990s and avoid any growth in the principal. Under less optimistic assumptions, the U.S. would need to pay 40 percent of its current export earnings simply to service the debt, which is greater than the ratio paid by Latin debtor countries today. Trade deficit problems are attributable to misbegotten and bad public policies as well as a complacent and arrogant private sector.

The way the U.S. has dealt with Latin American countries' debt is important to understanding the current economic scene because these countries are significant buyers of agricultural and capital goods. In 1983, the U.S. fostered a policy that has protected the solvency of U.S. financial institutions at the expense of all other sectors. In fact, Latin loans are the biggest asset in the portfolio of some banks.

The need for increased public investment in public goods (e.g., infrastructure, education, and research and development) was emphasized. In 1980, retirement, social security, and medicare programs represented 40 percent of federal spending. Despite the increase in inflation and in the number of elderly, the share of the federal budget devoted to these items has remained constant. Spending cuts in domestic programs allowed defense expenditures to increase. Wisconsin, with one of the lowest shares of defense industries, does not benefit by this shift in spending.

State Perspective

Speakers: John M. Shank, Ayse Somersan, and Clare W. Zempel

International trade represents an opportunity for Wisconsin's businesses. Over 1,000 businesses in Wisconsin could be exporting their output, but are not. Fifty thousand Wisconsin manufacturing jobs are export-related, but Wisconsin ranks 37th in terms of the state manufacturing output that is exported. To increase the benefits from international trade, trade barriers must be dissolved. Protectionism slows the economic restructuring process and hurts everyone. Trade restrictions cost Americans $50 billion annually in the form of higher prices, including $200,000 annually for each job saved. Government has an important role in breaking down the protectionist barrier. It should work to increase other countries' imports in order to enlarge U.S. markets rather than restrict the entry of other countries' exports.

American industry must become competitive through automation. With its skill base in machine tools and electronics, it was recommended that Wisconsin produce robots and other forms of automated products. Americans are now obsessed with the idea of competitiveness. The trade deficit, which is directly linked to the federal budget deficit, symptomizes slow moving politics, not low competitiveness.

Given the fact that the dollar peaked in 1985 and has since fallen 30 percent and that the trade deficit peaked last summer, it was suggested that Americans be patient because this is hardly a time for precipitous action. In addition, it was recommended that Wisconsin decrease its overall tax burden as Massachusetts did, facilitate retraining, graduate people with a liberal base of basic skills, and help people become lifelong learners.

Three major changes have already occurred in the U.S. economy to which the nation must now adjust. First, there has been an uncoupling of the primary goods economy from the industrial economy. The collapse of raw materials and agricultural prices that began in 1977 has had little direct impact on the industrial economy's growth.

Second, there has been an uncoupling of manufacturing production from manufacturing employment. Manufacturing has maintained its share of total output while employing fewer and fewer people. Consequently, policies to increase output must be separated from policies to increase employment. Since Wisconsin derives more than 20 percent of its personal income from manufacturing, the state has a stake in maintaining its competitiveness. It was recommended that firms be assisted in incorporating new technologies into their production processes, workers be aided in retraining and relocation, and that Wisconsin products be ones requiring highly-skilled and highly-paid workers. Also, Wisconsin's tourism should be promoted with consistency as well as quality and the types of services that make the elderly want to spend their latter years in Wisconsin should be developed because of the tremendous amount of unearned income controlled by these individuals.

The third change is that capital movements are the dominant force behind growth and change in the economy. Consequently, businesses must not only be makers of goods and services, but also financial managers. Given these three changes, time and appropriate policies will facilitate the economic adjustment required.

CRITICAL ASSUMPTIONS AND ISSUES RELEVANT TO OUR ECONOMIC FUTURE

Assumption

The economy will be increasingly impacted upon by global trade.

Issues

Should the VTAE system assist organizations in developing and implementing marketing concepts in today's global economy?

Should "trade" foreign languages be a routine option of general education curriculums?

Assumption

The workforce will continue to grow at slower rates than in the past.

Issues

Can displaced workers be identified prior to displacement in order to be assessed and trained for different occupations?

How can the VTAE system provide specialized services to target populations to assure access to training and job placement?

Assumption

The economy will spawn job growth that is strongest at the professional and technical level.

Issues

How can the VTAE system assure that all its students have the core competencies necessary for employment and everyday life?

How can VTAE resources be maximized by offering speciality programs?

How can the VTAE system assist in the formation and maintenance of small business and increase the number of entrepreneurs?

Assumption

Business and industry will continue to seek measures for cost containment and production efficiency.

Issues

Should the VTAE system increase its role in facilitating business and industry access to technology?

What role should the VTAE system play in improving productivity and quality in business and industry?

ADDITIONAL RESOURCES FOR ECONOMICS

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THE FUTURE OF WORKING
WISCONSIN

Manufacturing and Industrial Development

It has taken time, but the magnitude of the structural changes causing Wisconsin's manufacturing decline has been recognized. The fact that the state will never return to the "good old days" has been grudgingly accepted. However, accepting this new reality does not make the management challenge for Wisconsin companies any less daunting, but it does increase the likelihood that appropriate responses will be made to help assure the vitality of a smaller manufacturing base.

Kenneth S. Kinney
Allen-Bradley Company

A Perspective on Future Industrial Growth

Jerry J. Jasinowski

The long-term outlook for manufacturing presents particular problems for the state of Wisconsin. Wisconsin's economy consists of four major sectoral areas:

1) Natural resource-based industries such as mining and lumber;

2) Agriculture;

3) Durable manufacturing; and

4) Nondurable manufacturing.

The problems faced by these industries exhibit some common elements. However, this paper will address recurring causal themes, rather than attempt to completely analyze the developments within individual sectors.

Reduced to the essentials, the problems in natural resource industries and agriculture are inexorably bound up with deflation, high debt levels in conjunction with high real interest rates, and worldwide overproduction. In durable and nondurable manufacturing, the dollar's overvaluation has also been a serious problem, although it has been manifested more in import penetration than in lack of export opportunities. Both of these industries have proven vulnerable to the domestic business cycle. A distinctive aspect of their growth records, however, is that over the last 2 years, nondurables have performed significantly better than durables. Of these thematic areas, I will concentrate primarily on manufacturing, since that is the National Association of Manufacturers' (NAM) quintessential area of expertise. Consequently, following a brief discussion of debt and deflation-related issues affecting natural resources and agriculture, key differences among factors affecting durable and nondurable manufacturing and the impact of recent policy developments on both sectors will be considered. Finally, in conclusion, the NAM's policy program will be summarized.

Debt, Deflation, and the Natural Resource Sector

The recent problems experienced by agriculture and natural resources have been due in large part, to the over accumulation of debt followed by a price deflation.

The recent problems experienced by agriculture and natural resources have been due in large part, to the over accumulation of debt followed by a price deflation. This imposed a sharp squeeze on the cash flow of these sectors. During the 1970s, high inflation rates caused sharp increases in commodity prices. Natural resource industries borrowed heavily in order to expand. In some instances, this tendency toward overbuilding of debt was due to the misjudgment of banks. They encouraged excessive borrowing based upon the incorrect assumption that loans collateralized by commodity-based production would be secure and would guarantee high return rates. The result, however, was a tendency toward overproduction precisely at a time when monetary policy was turning toward restraint. During the early 1980s, agriculture and natural resource-based industries were caught in a vice between rising interest payments and falling prices.

This phenomenon in itself was nothing new, although it was so infrequent in the postwar era that producers were not alert to the danger. By comparison, most recessions prior to World War II were generated precisely by this cyclic overbuilding of debt followed by declining prices, forcing liquidation of collateralized assets, and thereby, further depressing prices. In this sense, the depression experienced by natural resources and agriculture reflects precisely the same type of merchanism identified by economists (Fischer, 1933) in the 1930s as responsible for the Great Depression.

Surprisingly, however, the recovery from 1983 to 1987, which has now lasted approximately 58 months and is considered relatively long by historical standards, has been associated with only an anemic and partial recovery in these sectors. One reason for this was the unprecedented appreciation of the dollar until early 1985. This rise in dollar value put considerable downward pressure on prices, particularly in sectors that were vulnerable to import penetration. This, in conjunction with high unemployment rates and chronic overproduction, kept prices relatively stable in the aggregate and perpetuated deflationary tendencies in others. Consequently, primary sectors were not able to reap the benefits of the rise in inflation typically associated with postwar recoveries, but continued to languish in a state of semidepression.

Foreign countries were only able to raise their growth rates by exporting, thereby creating worldwide conditions of excess supply.

The primary sectors' conditions reflect a problem of excess supply that is fundamentally global, rather than merely national in nature. The causes of worldwide excess supply are severalfold. Primarily because of restrictive macroeconomic policies overseas, aggregate foreign demand has on average been unusually weak, both in the other industrial countries and many of the less developed countries (LDCs). From 1982 to 1985, effective domestic demand grew at a 4.5 percent annual rate in the U.S., compared to 2.4 percent in Japan, and 1.1 percent in Europe. The result was that foreign countries were only able to raise their growth rates by exporting, thereby creating worldwide conditions of excess supply. Tendencies toward excess supply in global markets have been visible mainly in primary materials, where falling prices are indicative of a worldwide glut.

The emergence of global excess supply also reflects political factors. Among the industrial countries, Germany and Japan have consistently eschewed stimulus, and because the West European currencies were tied to the mark, Germany's restrictive demand management policies implied similar restraint throughout Europe. More importantly, the debt crisis of the third world countries forced them to restrict domestic demand and attempt to generate trade surpluses. Although the LDC debt situation is no longer as dangerous as it was in 1982 when a wave of defaults seemed possible, the accumulated external obligations of the third world are such that the LDCs cannot absorb more American goods and are forced to export to the U.S. in order to generate foreign exchange.

Aggregate Industrial Performance

A distinctive feature of the current recovery is that since mid-1984, manufacturing output in the aggregate has stagnated, with industrial production rising by a cumulative total of 1.6 percent. With no dramatic economic turnaround by the end of 1988, industrial activity will have been stagnant for a period of over 40 months--longer than the duration of many postwar cycles.

The extent of the manufacturing stagnation can be seen by comparing industrial growth in this business cycle with previous major postwar recoveries. By this benchmark, the recovery of the mid-1980s has been one of the weakest on record. In length, the current recovery is exceeded only by the 1961 to 1969 and 1975 to 1980 expansions. However, although the majority of postwar recoveries were shorter, a higher absolute gain in industrial production was achieved not only in the longer 1961 to 1969 and 1975 to 1980 cycles, but also in the slightly shorter Korean War boom from 1949 to 1953 and the much shorter expansion of 1971 to 1973. The total increment over 58 months of expansion from 1982 to 1987 has been only 28.7 percent compared with an average of 46.2 percent over 53 months. The weakness of the current expansion becomes more clear when average growth rates are compared: This cycle witnessed the second slowest increase in GNP or gross national product (4.0 percent per year compared to 5.3 percent on average) and the slowest increase in industrial production (5.7 percent per year against an average of 8.6 percent).

The prognosis that this recovery has been subnormal is, however, subject to one important qualification. The recovery was exceptionally rapid in the initial stages, but subsequently lapsed into a prolonged stagnation period. For approximately 18 months, industrial growth rates were stronger than average, but this uniquely front-loaded pattern was to ultimately prove unsustainable. The two-stage nature of this recovery can be seen from a comparison of growth rates by sector over time: In total industrial production, durable manufacturing, and output of business equipment, virtually all growth occurred during the first 18 months of the recovery. The growth rate of nondurable manufacturing was considerably smoother. The initial boom produced a smaller 16.7 percent gain, with the result that the ensuing slowdown was less marked, yielding a 7.8 percent gain from mid-1984 onward. This is less skewed than the performance of durables, which grew 31.1 percent in the first 19 months and 0.39 percent in the next 25 months.

Even among durables, however, there were differences across sectors. Output of autos and construction materials has been relatively robust, the latter reflecting consistent strength in housing starts and nonresidential buildings. By comparison, nonelectrical machinery, farm equipment, mining equipment, and basic metals underwent only relatively weak recoveries from the 1981 to 1982 recession and have experienced flat or declining output during the last 2 years. Defense and aerospace did not exhibit this uneven pattern, although these are special cases, since these sectors' continuously robust growth is attributable to military appropriations.

There are several reasons for the better performance of nondurables, such as:

- Sensitivity to interest rates;
- Sheltered markets;
- Sector-specific weaknesses; and
- Differences in import penetration.

Sensitivity to Interest Rates. First, because most nondurables are purchased through short-term disposable income rather than long-term borrowing, they are less sensitive to interest rates. By comparison, the level of effective demand for many durables is dependent not so much on current disposable income, but rather on the cost and availability of long-term debt. Given the level of real interest rates during this recovery, the remarkable fact is not that nondurables have done better during the last 2 years, but that durables have experienced any growth at all. That output of consumer durables, particularly housing and autos, has continued to increase, reflects both favorable demographics--the weighting of the population toward the high-consumption 25 to 40 age bracket and the willingness of consumers to take on unprecedented levels of debt.

In some instances, small regional firms have been able to operate in sheltered, localized markets.

Sheltered Markets. Further, nondurables are in some instances less subject to import penetration, because the productive structure is more dispersed and more local. The result is that in some instances, small regional firms have been able to operate in sheltered, localized markets. By comparison, in some durable sectors, the productive structure is more effectively national in character. As a result, output in these sectors is more dependent on national developments. The greater dispersal of nondurable production and its access to sheltered markets is by no means, accidental. It reflects the fact that large-scale production facilities are not necessary for many small-ticket items.

Sector-specific Weaknesses. Apart from general economic conditions, sectoral shortfalls in industrial production have been associated with industry-specific weaknesses in demand for manufacturers. In large measure, this has been bound up with conditions in particular sectors. The devastation of the energy industry by the collapse in world oil prices has reduced demand for drilling equipment and pipelines. The well-publicized agricultural crisis has reduced demand for farm machinery. Tax reform should further reduce demand for capital goods, ranging from machine tools to computers, and for construction materials in view of expected declines in housing starts, new apartment buildings, and offices.

There may also be tendencies toward market saturation. Excess capacity and heavy spending on data processing equipment over the last few years have led to major liquidations and price reductions in computer equipment. The surge in automobile sales in late 1986 was deceptive in that it was achieved only through discount financing. As interest rates have increased in 1987, the automobile industry has experienced an unsustainable inventory pileup.

Advances in technology and efficiency have contributed to diminished demand for certain types of manufactured inputs.

One longer-term cause of sector-specific weaknesses has to do with changes in the sectoral mix of inputs. Here, advances in technology and efficiency have contributed to diminished demand for certain types of manufactured inputs. In industries as diverse as autos and telecommunications, plastics and other synthetic materials have increasingly replaced primary metals. As a result, advanced manufacturing has increasingly shifted away from materials and toward high-tech products as a source of inputs.

Differences in Import Penetration. There have been marked asymmetries in the degree of import penetration across industries. In several durable and nondurable sectors, imports now comprise the majority of domestic consumption. Data collected for 1985 revealed considerable disparities across sectors.

Ratios of Imports to Domestic Consumption in Selected Industries

Imports	Ratio of imports to domestic consumption, percent
Radios and televisions	63
Leather goods	58
Machine tools	40
Semiconductors	40
Clothing	25
Autos	20
Industrial chemicals	19
Aerospace	18
Construction equipment	16
Instruments	16
Household appliances and furniture	15

Source: National Association of Manufacturers, International Economic Affairs Department, 1986.

Import penetration has been a highly uneven process, with some industries highly vulnerable and others managing to surrender only a minimal share of the market to foreign suppliers.

The Causes of Stagnation

The tendency toward ongoing stagnation since the summer of 1984, reflects a confluence of several unrelated factors. One has to do with the normal cyclical movements of investments and aggregate demand, for example, the inherent volatility in the business cycle process. The others have to do more with policy content, in particular, the stance of fiscal policy that has been reflected both in the domestic sector and in the trade deficit.

Volatility in the Business Cycle. Some of the strength of the initial rebound had to do with the fact that the anteceding recessionary period from 1980 to 1982 was exceptionally severe, with two consecutive downturns taking place in only 3 years. Because of the extraordinary length of the 1980 to 1982 downturn, there was considerable pent-up demand, particularly in durables and housing, which caused the economy to expand unusually rapidly. This surge was deceptive, however, because once the recession snapback was complete, there was not enough underlying strength to sustain the momentum of expansion.

The stance of fiscal and monetary policy has evolved from extreme stimulus at the start of the cycle to fiscal neutrality.

Front-loaded Policy Stimulus. The stance of fiscal and monetary policy has evolved from extreme stimulus at the start of the cycle to fiscal neutrality, with monetary policy remaining accommodative but not aggressively reflationary.

In 1982 to 1983, the Economic Recovery Tax Act's (ERTA) tax cuts increased defense spending, and a deficit of roughly 7 percent of the GNP created the most expansionary nonwartime fiscal policy on record. Simultaneously, in 1982 to 1983, the Federal Reserve reflated, virtually ignoring its monetary target ranges in order to end the global recession and prevent the third world debt crisis from escalating into a wave of defaults. However, monetary policy was subsequently tightened in 1984, braking the force of the initial expansion, due to widespread fears that the economy was overheating.

While fiscal deficits have remained large, their impact has been less stimulative because of the level of interest rates. In essence, the short-term income-expenditure effects of fiscal expansion have been outweighed by the longer-run contractionary effects of "crowding out" in financial markets. At the same time, the effectiveness of monetary policy since late 1984 has been partially vitiated by the unprecedented decline in velocity. The result is that the rapid growth in monetary aggregates has translated into disproportionally small gains in output.

While the Federal Reserve provided greater stimulus in early 1986 by aggressively lowering interest rates through repeated cuts in the discount rate, more recently it has been constrained by the unwillingness of Germany and Japan to undertake similar expansionary moves and by the inflation rate's rise in early 1987. The effectiveness of interest rate reductions has further been limited by underutilization of capacity. In essence, because of the relative ineffectiveness of major policy levers and because of the latent dangers entailed by a substantially more reflationary policy, the Federal Reserve passively awaited developments in the market in 1986, preferring to follow the economy rather than be proactive.

The rise in inflation rates this year in conjunction with the sharp devaluation of the dollar during the first quarter, caused the Federal Reserve to undertake slight tightening measures in an effort to prevent prices from escalating further.

As of early 1987, however, the Federal Reserve's reaction function appears to be emphasizing disinflationary objectives rather than countercyclical ones. The rise in inflation rates this year in conjunction with the sharp devaluation of the dollar during the first quarter, caused the Federal Reserve to undertake slight tightening measures in an effort to prevent prices from escalating further and reduce inflationary expectations in financial markets.

The Trade Deficit. The dollar's appreciation and differentials in the growth of demand between the U.S. and other industrial countries has generated a massive and unprecedented deficit in merchandise trade, depressing the growth rate. From a growth accounting perspective, much of the slowdown in GNP since mid-1984, or about 2 percentage points per year, is directly attributable to the deficit in net exports.

Factors Affecting the Economic Outlook

A complete description of the economic outlook is beyond the scope of this paper. Consequently, the ensuing discussion will be selective in nature, focusing on two major areas that will be critical to the economy's performance--the exchange rate and tax reform implications. A third factor that may have some future influence on the economy's behavior is the buildup in private sector indebtedness, although as yet, the evidence of its implications is mixed.

The most favorable development vis-à-vis the trade deficit has been the dollar's decline.

Progress on Exchange Rates. The most favorable development vis-à-vis the trade deficit has been the dollar's decline, although on close examination, the depreciation of the exchange rate has been sufficiently asymmetric that its benefits will also be uneven. Although the dollar has fallen sharply against the West European currencies and the yen since early 1985, this has not been matched by similar devaluations against other countries. In this respect, alternative measures of the exchange rate provide dissimilar estimates of the degree of depreciation that has taken place. For instance, while the Federal Reserve's G-10 index (a multilateral trade-weighted index comprising the leading industrial nations) indicates a devaluation of -39 percent, the broader Morgan Guaranty weighted index of 44 countries indicates only a -19 percent devaluation since early 1985. The preferability of a wider measure of the exchange rate may be evidenced from the fact that countries excluded from the G-10 index now comprise more than 40 percent of America's merchandise trade. Most of the LDC currencies have not appreciated against the dollar; some have actually continued to fall. The exchange rate has actually appreciated against Canada, which accounts for about 19 percent of merchandise trade, and has risen or fallen only very slightly against the newly-industrializing countries of Southeast Asia. Meanwhile, several major Latin American countries have devalued against the dollar in an effort to meet their debt service requirements by boosting exports.

Foreign suppliers have been willing in many instances to accept compression of profit margins as the tradeoff for retention of market share.

While the dollar has fallen against Europe and Japan, the favorable effects of the exchange rate realignment have been partially offset by microeconomic factors. Foreign suppliers have been willing in many instances to accept compression of profit margins as the tradeoff for retention of market share, while domestic firms may interpret increases in import prices as a signal for price increases aimed at raising profitability. The result is that the improvement in competitiveness has been less than implied by the exchange rate alone.

Despite the various factors hampering the realignment in the exchange rate from exerting its full effect on the trade sector, as of early 1987 there is conclusive evidence of an external deficit improvement. While the balance of payments on current account still shows large deficits, during the last three quarters, the deficit on net exports in constant 1982 dollars has fallen by about $38 billion. This is a statistically significant magnitude, and furthermore it should be noted that since net exports are measured in real rather than in nominal terms, this improvement has translated into corresponding improvements in GNP. In essence, the trade deficit now appears to have peaked, and will improve consistently from this point onward.

Tax Reform. Tax reform is likely to have unfavorable implications for durable goods, particularly machine tools and other capital equipment. The new tax laws incorporate several provisions that are likely to reduce capital spending: 1) The retroactive deletion of the investment tax credit (ITC) to 1986; 2) The effective rescission of accelerated depression (ACRS) through the lengthening of some capital asset lives; and 3) The imposition of the new corporate minimum tax, provisions against which the transition from the 150 to the 200 percent declining balance methods for equipment militates very little.

A related provision in the new tax laws that has not been accorded sufficient attention is the changes in the accounting rules, under which all manufacturers would be obliged to capitalize indirect production costs. Under the previous tax code, using the short-term method of accounting, indirect production costs could be fully expensed during the year in which they were incurred. The new laws specify that indirect production costs must be capitalized and depreciated over a period of several years. The deletion of the ITC and the modifications to ACRS together raise the user cost of capital by magnitudes of 18 to 20 percent. The change in the accounting provisions may raise the user cost of capital by as much as an additional 3.5 percent.

Tax reform will lower business fixed investment by as much as 17 percent relative to current law over a 6-year-period.

Econometric simulations indicated that holding all else constant, tax reform will lower business fixed investment by as much as 17 percent relative to current law over a 6-year-period (Prakken, 1986). However, the near-term effects will be compounded by the economic slowdown and by widespread underutilization of capacity (currently somewhat less than 80 percent). The result is that nonresidential fixed investment is projected to decline by 4 percent over 1987, with the largest declines coming in equipment.

This result will further skew the performance of durables and nondurables. While consumer demand for nondurables should be stimulated by the increment in disposable income, production of durables will diverge below the level it would have attained under previous tax laws.

Escalating Debt. Previously, excessive indebtedness was noted as a cause of agriculture's collapse. During the last 2 years, an equally disturbing trend has emerged with respect to aggregate private sector debt, both personal and corporate. During this recovery, the growth of consumption has consistently outstripped the growth of disposable income, resulting in seriously depressed savings. Further, because of the level of interest rates, the high propensity to finance consumption by borrowing has led to a massive buildup in personal debt, with the ratio of mortgage and installment obligations to personal income now well above the peaks reached in prior cycles. The ratio of personal mortgage, installment, and credit-card debt to personal disposable income is now in the range of 75 percent. This compares with a previous peak of 68 percent in late 1979 during the final stages of the last recovery.

The debt buildup points in the direction of a downturn in the business cycle within the next few years, which would seriously compound the difficulties already facing manufacturing.

The debt escalation implies two major risks for the economy. The less likely possibility is a wave of defaults, wholesale liquidations of collateral, and widespread bank failures. These situations are similar to the scenario that has emerged in agriculture. While not without precedent during the depressions of past historical epochs, this is less probable than the alternative risk that both consumers and businesses will be forced to retrench and pay down debt. Although the catastrophic consequences of a debt-deflation recession would here be averted, a milder recession would nonetheless develop. In this respect, the debt buildup points in the direction of a downturn in the business cycle within the next few years, which would seriously compound the difficulties already facing manufacturing.

Future Implications for Manufacturing

The extent of the slowdown in industrial activity is such that the threat of ongoing stagnation in manufacturing has recently reemerged. If, as projected, slow growth persists in the 1987 to 1988 period, American industry will have been locked in a situation of endemic stagnation for a period of 4 to 5 years. Further, a recession before the end of the decade would exacerbate this situation. Depending on the content of macroeconomic policies and the performance of the private sector, two scenarios can be differentiated for American manufacturing during the 1990s.

A continuation of the current trends, which seems more likely in view of the massive tax increases imposed on the capital sector by the recent "reform" of the tax code, would bring continuation of industrial stagnation, depressed capital formation, and massive trade imbalances. The U.S. would face the gradual deterioration of its capital stock in heavy industry over the next decade, and its reduction to a second-rank industrial power status in the 1990s.

Against this, the application of new technologies and better management in manufacturing would militate very little. Even highly favorable microeconomic developments along the lines of productivity-enhancing technologies cannot offset the negative impact of poorly conceived macroeconomic policies.

A new industrial strategy is needed in which the government makes systematic efforts to support manufacturing.

An alternative scenario would be one of a new industrial strategy, in which the government makes systematic efforts to support manufacturing. This would not necessarily involve an industrial policy in the sense of sector-specific government intervention to manage structural adjustment in particular industries. Rather, NAM has developed a 12-point program designed to facilitate faster growth and stimulate improvements in trade competitiveness through the following guidelines:

- There should be a national commitment to trade competitiveness.
- There should be an increased recognition of manufacturing's importance to economic health.
- The fiscal deficit should be reduced.
- Trade policies should be strengthened to stimulate exports.
- The exchange rate should be lowered.
- Improvements in corporate ability to compete are essential.
- There should be further regulatory reform to reduce governmentally-mandated costs on the private sector.
- Policies should be instituted to raise investment and savings.
- Greater support should be given to technological innovation.
- A more stable financial environment should be created.
- Investments in education and retraining should be made.
- The central criterion for major policy decisions should be their impact on trade competitiveness and growth.

There Should be a National Commitment to Trade Competitiveness. Currently, the country is at a crisis point in its trade competitiveness and should make this commitment the leading economic priority for both public policy and the private sector.

Higher growth rates in industrial production will be necessary to eliminate the trade deficit without domestic output losses.

There Should be an Increased Recognition of Manufacturing's Importance to Economic Health. In this respect, growth in industrial production has historically driven growth in GNP by creating demand for services, while manufacturing productivity gains are typically about three times as great as for the aggregate economy, and industry represents the primary source of technological innovation. Further, since about 75 percent of the trade deficit has been in the manufacturing sector, higher growth rates in industrial production will be necessary to eliminate the trade deficit without domestic output losses.

The Fiscal Deficit Should be Reduced. The structural deficits that are projected to persist for the remainder of the decade are not commensurate with macroeconomic stability; further, their impact will be particularly deleterious to manufacturing industries that are sensitive to high interest rates and vulnerable to import penetration. A systematic plan is needed that will bring the deficit down to levels that will insure lower interest rates, a more realistic exchange rate, and a stable business cycle. The avoidance of tax increases and concentration on spending reductions as a means of achieving fiscal restraint constitute the central components of this strategy. The adoption of fiscal targets commensurate with these objectives, for instance, by bringing the budget into surplus at full employment, could go a long way toward setting the stage for future industrial prosperity. An economic and budget summit meeting between the White House and congressional leaders for the purpose of fundamentally coming to grips with the structural budget deficit problem should be actively pursued by both sides.

Trade Policies Should be Strengthened to Stimulate Exports. Major policy priorities include:

- Pressing the other General Agreement of Trade and Tariffs (GATT) countries for meaningful improvements in forthcoming multilateral trade negotiations;
- Entering into a free-trade agreement with Canada that advances the interests of American industry;
- Establishing a joint business-government market development program targeted on Japan and modeled on the highly-successful Market Development Cooperation Program established by the U.S. Department of Agriculture in the 1950s;
- Insisting that foreign governments remove their unfair trade barriers and discontinue unfair practices;
- Cutting back on the export control list and lessening the burden of export controls;
- Offering American corporations the financial support needed to compete with foreign manufacturers that benefit from effective government financing programs;
- Undertaking new efforts to open foreign telecommunications markets to American products;

- Reforming the Foreign Corrupt Practices Act;
- Amending the Tariff Act to protect intellectual property rights in the U.S.;
- Improving the escape clause of the Tariff Act;
- Reviewing antidumping laws; and
- Tightening laws against imports that threaten national security.

The Exchange Rate Should be Lowered. The rate should be at levels commensurate with purchasing power parity, through bilateral negotiations with countries where there has been no exchange rate improvement, such as South Korea, Taiwan, Brazil, and Canada. Congress should work with the administration to develop options for longer-term exchange rate reform.

At least one-fourth of the improvement in international competitiveness will have to come from improvement in corporate practices in the private sector.

Improvements in Corporate Ability to Compete is Essential. In this respect, the NAM Board of Directors recently agreed that at least one-fourth of the improvement in international competitiveness will have to come from improvement in corporate practices in the private sector. These include cost reductions through restructuring, quality improvements, more aggressive foreign marketing, accordance of a higher priority to improvements in manufacturing processes, encouraging greater employee commitment to competitiveness, and greater application of research to the production process.

There Should be Further Regulatory Reform to Reduce Governmentally-mandated Costs on the Private Sector. Regulatory reform should include new product liability standards, greater deregulation of transportation, reform of antitrust laws, avoidance of shifting the cost of government programs to the private sector, and general reductions in regulatory burdens.

Policies Should be Instituted to Raise Investment and Savings. In this respect, with tax reform already in place, there is little that can be done to alleviate the short-term contraction in investment that will result from its provisions. Nevertheless at some future time, there may be greater opportunities for raising capital formation through the tax code. These would include:

- Consideration of an investment tax credit for equipment used in manufacturing;

- Exemption of depreciation from the alternative minimum tax;
- Modification of accounting provisions regarding capitalization of depreciable assets;
- Provisions to encourage greater individual savings, including restoration of IRA deductibility; and
- A shift in the basis of taxation from income to consumption in the long run that would have the effect of raising the investment share of GNP and lowering the consumption share.

Greater Support Should be Given to Technological Innovation. This can be achieved through extension of the research and development (R&D) tax credit, increased civilian R & D spending, and increased protection of intellectual property.

A More Stable Financial Environment Should be Created. Stability can be gained by regulating hostile takeovers, requiring that the notification threshold for company acquisition be lowered, and that the time period for offers be extended. The U.S. Securities and Exchange Commission (SEC) should be given increased power to pursue insider trading and other abuses.

Providing displaced and low-skill workers with education and retraining should be emphasized.

Investments in Education and Retraining Should be Made. Providing displaced and low-skill workers with education and retraining should be emphasized.

The Central Criterion for Major Policy Decisions Should be Their Impact on Trade Competitiveness and Growth. Major governmental actions should be subjected to a competitiveness impact statement. Further, as part of making competitiveness a national priority, existing government agencies should be consolidated into a single U.S. Department of International Trade and Industry.

Conclusions

There is little doubt that in the event that a legislative program of this type were fully implemented, the result would be a significant improvement in the manufacturing industries' performance, at least in the long-term. Unfortunately, however, the political consensus required to carry out a program of this type does not appear to exist. In the critical fiscal policy arena, both republicans and democrats are pressing to achieve their particular spending programs, without paying sufficient attention to the overall macroeconomic implications of the budgetary stance. Notwithstanding the serious difficulties confronted by manufacturing over the last few years, some forces in the U.S. Congress are now pressing for ambitious mandated benefit programs, seemingly unaware of their associated costs to industry.

In the absence of a systematic program aimed at industrial revitalization, manufacturers have little to look forward to except a continuation of the status quo.

In the absence of a systematic program aimed at industrial revitalization, manufacturers have little to look forward to except a continuation of the status quo. The recent devaluation of the dollar has substantially improved the trade outlook, with the result that real net exports are expected to show annual improvements of as much as $25 billion (in constant 1982 dollars) over the next 2 years. Nevertheless, the gains on the trade front will be mitigated by weaknesses in domestic demand, particularly in the investment sector, with the result that the economy's growth is likely to be somewhat slower in 1987 to 1988 than over the past few years. There is at the present time, little danger of a major recession. However, a substantial downturn could emerge, for instance in early 1989, due to forces largely outside the policymaker's or the private sector's control. Somewhat paradoxically, a sharp downturn in the business cycle, whatever its short-term costs to manufacturers, could ultimately provide the catalyst to cause policymakers to undertake a systematic commitment to supporting industrial sectors.

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The Role of Wisconsin Electric Power Company in State Economic Development

Lisa C. Berman

This paper will discuss the direction of Wisconsin's economy and Wisconsin Electric Power Company's (WEPCo) contribution to future economic development.

The Past Determines the Future

Historically, Wisconsin's economy has performed extremely well. The 1970s were prosperous and the state even earned the nickname, "star of the snowbelt."

During those years, Wisconsin's unemployment rate fell relative to the rest of the U.S., and was actually below the U.S. average. Disposable income was greater than the national average as well. Manufacturing became Wisconsin's strongest sector and gained jobs throughout the 1970s. We were riding high and felt impervious to the market pressures that were affecting neighboring states.

> *Wisconsin's reliance on manufacturing industries had been turned from a strength into a weakness with the turning of economic tides.*

A hard lesson was learned in the recession of the early 1980s. Wisconsin suddenly lost 134,000 jobs, and the unemployment rate began to exceed the national average. The reliance on manufacturing industries had been turned from a strength into a weakness with the turning of economic tides.

In the past several years, Wisconsin has experienced some recovery in employment levels, but not to the point that they had been in the past. Those new jobs were in various industries, including trade and service. This variety, however, made Wisconsin somewhat less vulnerable to economic shifts.

Challenges for Future Economic Growth and Development

Today, there are many factors affecting manufacturing that are beyond the control of Wisconsin residents, government, and business. Pressures from foreign competition, trade deficits, and the dollar's strengths and weaknesses must be faced because future economic growth is more important than ever. The ability to respond as flexibly as possible to market forces is key to insuring a healthy economy. This does not simply mean relying on consumer demand for a particular product. Instead, government and business alike must pay attention to trends in wage rates, management techniques, regulation of business, investment patterns, world trade, educational offerings, and new product development. We need to be competitive in every arena if we hope to position Wisconsin for future prosperity.

At the same time, we need to be realistic. Just because silicon chip production is a major employer on the West Coast does not mean Wisconsin should target that as a growth industry. It is important to recognize that several "old standbys" will not employ as many people as they once did. For instance, brewing is still a viable industry for this state, but the trend is toward smaller, highly-automated plants that do not employ thousands of workers.

Wisconsin must target industries that complement the advantages the state has to offer business.

In order to be realistic, Wisconsin must target industries that complement the advantages the state has to offer business. A recent study by Ameritrust Corporation (1986) identified the Midwest as standing in the mainstream of social changes taking place in society and in business. These changes included global competition, the availability of new technologies, shifts in personal values, and the development of new corporate structures.

Wisconsin's challenge becomes one of capitalizing upon these changes by:

- Applying new technologies to improve productivity;
- Applying new technologies to develop new products;
- Finding niches for the state's businesses in global markets; and
- Providing an infrastructure conducive to business growth.

Relying on the old competitive advantages of location, transportation, natural resources, and protected markets will not help to gain manufacturing strength. The creation of a competitive advantage relative to today's economic realities is urgently needed.

There are five key factors necessary to creating a competitive advantage in Wisconsin. They are:

- Providing access to technology. Continuing to nurture and develop facilities in the University of Wisconsin (UW) and vocational education systems will achieve this.
- Providing an affordable, skilled, and flexible workforce. Wisconsin's workforce is skilled, and its educational system can provide the flexibility with training programs. Both aspects can

be affordable. A study by WEPCo (White, 1985) showed that unemployed and formerly highly paid, unionized workers would be willing to take a job for about $6 an hour. In another example, a blind ad for an industrial prospect showed that approximately 1,500 people in two small Wisconsin communities would be willing to work for $4 an hour.

- Building and maintaining adequate infrastructure. Wisconsin is fortunate that its road, water, utility, and other traditional infrastructure is in place and can accommodate growth. Today, there is also a demand for new infrastructure, including telecommunications and cultural advantages, which we currently are developing.
- Acquiring capital for business investment. There are many initiatives taking place in this area, including some by WEPCo.
- Developing a positive entrepreneurial climate.

Bringing these elements together should encourage business growth in various industries enabling Wisconsin's economy to be healthy and prosperous through the beginning of the next century. However, the shape of that economy probably will be different than the heavy manufacturing emphasis of the past. While it would be profitable to add new auto plants or another Allen-Bradley Company to Wisconsin, reality and market forces suggest that we should expect something quite different.

Economic growth in the next 20 years will come from small businesses, particularly those in the service sector.

Economic growth in the next 20 years will come from small businesses, particularly those in the service sector. A 1986 report ("The state, 1986) by President Reagan to the U.S. Congress on small business noted that small business grew 5.1 percent in 1985, compared with a 0.70 percent growth for big business. These small businesses employed more youth, women, veterans, and unemployed that did big business and were major contributors of new jobs, innovative products, and services. Small business will provide more than 90 percent of all future job growth.

Furthermore, the impact of the service sector on Wisconsin's economy should not be overlooked. Growth in well-paying industries such as research, finance, insurance, transportation, and business services must be considered. The Guardian Life Insurance Company of America is one service sector business that brought its processing facility to Appleton, Wisconsin, and is employing hundreds of people.

Wisconsin Department of Development (1986) figures reveal that today's service sector employs 65 percent of the Wisconsin workforce. Between 1972 and 1985, that sector created 97 percent or 400,000 new jobs. Manufacturing, by comparison, created 17,000 new jobs in the same period. We should not lose sight of these facts as we target industries for economic development purposes and as we devise state policies. These service industries are very mobile entities, since they do not have large investments in physical plants. They can move their operations as conditions warrant. Wisconsin must nurture and encourage their growth in order to reap the benefits of jobs, tax dollars, and economic prosperity that this sector can bring.

Wisconsin Electric's Contribution to Economic Development

Like the state economy, WEPCo is in the midst of major change. An understanding of the past is necessary before the future can be discussed.

Wisconsin Electric Power Company began as a railway transportation company. The company diversified into electricity before the turn of the century, but designed its downtown offices for conversion into a hotel in case electricity was not a profitable endeavor. But electricity proved profitable and WEPCo has been on the cutting edge of electric generation technology over the years. Today, WEPCo is a $1.4 billion company with more than 800,000 customers. To arrive at this point, the company has had to be flexible in response to the impact of technological and social change.

Wisconsin Electric Power Company has taken a role in encouraging Wisconsin's economic growth on two fronts. First, the company is marketing the state's attributes, and second, it is making solid investments in the future. These efforts are such a high priority at WEPCo that the entire company has been restructured in order to better pursue these goals. In fact, WEPCo is now only one part of the new Wisconsin Energy Corporation, a company that has two utility subsidiaries and three economic development subsidiaries. These three for-profit subsidiaries, called WISPARK, WISVEST, AND WITECH, will invest approximately $30 to $50 million a year in Wisconsin.

The WISPARK subsidiary is WEPCo's first priority. This subsidiary will build large-scale, high-tech industrial parks in southeastern Wisconsin. Land has already been purchased at sites near Kenosha and Pewaukee, Wisconsin, and tenants are expected in the Kenosha facility by early 1988. One park will focus on medium to heavy industry and the other will be a high-tech research park taking advantage of its location between Milwaukee and Madison. Estimates show that 30,000 jobs could be created by businesses locating at these parks.

A second subsidiary is WISVEST. This subsidiary will focus investments on inventions and research findings that need capital to bring them to commercial viability. The WITECH subsidiary will provide the seed capital to take those developments from such places as the UW and the Medical College and bring them to the market. WITECH made its first investment earlier this year when it put $500,000 into Progressive Energy Systems, Limited, of Pewaukee, a company that designs and installs cogeneration energy systems. More investments are planned.

Marketing is the Key

There has been a $250,000 marketing campaign launched from WEPCo's Office of Economic Development that will convey a positive message about Wisconsin's effects to target industries across the country. For 1987, those target industries are insurance and other financial services, the food industry, and the printing industry. These industries were selected based upon several factors, including potential for job growth, stability, ability to use Wisconsin's existing workforce, and ability to use Wisconsin research and business resources.

This highly-targeted marketing program will use advertisements, telephone contacts, personal calls, and direct mail to inform businesses about Wisconsin's advantages and to develop solid business leads. Programs will be geographically targeted, focusing on Chicago and New York. Chicago was selected based on its proximity and also its sheer market size. New York cannot be overlooked since it is the location for many corporate headquarters and represents a place where many site location and expansion decisions are made.

WEPCo is attempting to generate genuine business expansion leads, develop local business growth, and encourage positive attitudes about Wisconsin's business climate.

Wisconsin Electric Power Company's economic development plans are simple: The company is attempting to generate genuine business expansion leads, develop local business growth, and encourage positive attitudes about Wisconsin's business climate among those who live inside and outside the state.

In contributing to economic development, WEPCo is committed to Wisconsin and its future vitality. By working together with the state and local communities, WEPCo intends to identify future growth opportunities and pursue them energetically.

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Manufacturing in Wisconsin: Times are Changing

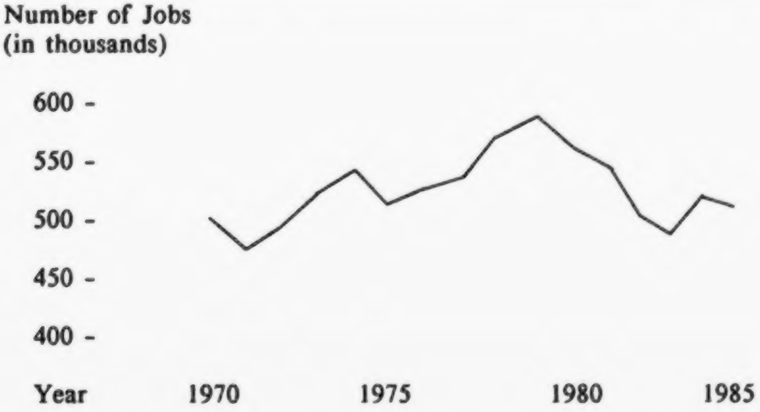
Kenneth S. Kinney

Virtually any agricultural analysis in Wisconsin and most discussions of the state's economy in general make note of the bold statement on our license plates: "America's Dairyland." Despite this assertion, Wisconsin has been for some time and, fortunately, remains a manufacturing state--an unromantic notion hardly fitting for automotive bumpers.

Manufacturing is the state's largest industry, employing about 30 percent of Wisconsin workers. If the state continues to be fortunate, Wisconsin will remain a center of manufacturing, with many high-quality jobs and companies, though certainly not so many as there were in the peak years of the late 1970s. State manufacturing jobs are high-quality, partly because they are high-paying: Incomes for manufacturing employees are well above those for workers in wholesale and retail trade, the state's number two industry.

The good old days of the 1970s existed before the impact of major national and international economic changes became evident. These changes contributed to the loss of thousands of manufacturing jobs and numerous companies, some of which helped to make Milwaukee, Wisconsin, famous. The manufacturing sector grew at a steady, but unspectacular 2 percent per year in the 1970s and shrank at a slightly faster pace between 1979 and 1986.

Manufacturing Employment in Wisconsin, 1970 to 1986



Source: U.S. Department of Labor, Bureau of Labor Statistics & Wisconsin Dept. of Industry, Labor, and Human Relations (1987).

Wisconsin's Smaller Manufacturing Base

It has taken time, but the magnitude of these structural changes causing a manufacturing decline has been recognized. The fact that Wisconsin will never return to the "good old days" has been grudgingly accepted. However, accepting this new reality does not make the management challenge for Wisconsin companies any less daunting, but it does increase the likelihood that appropriate responses will be made to help assure the vitality of a smaller manufacturing base.

The structural shifts in the economy produced one overwhelming result: more intense competition for most industries. Common rhetoric to the contrary, most businesses were never overly fond of tough competition in the first place. This competition has, not surprisingly, caused severe problems for some marginal industries and companies. Several widely known corporate names connote far less now than they did 10 years ago.

New World Competition

Behind much of this competitive transformation has been the process of "globalization," an ungainly term, but one that aptly describes the increasing unity of world markets, with the resulting increase in international competition for U.S. manufacturers. For the first time, many major Wisconsin industries are experiencing the rigors of *real* competition, often brought on by the presence of foreign competitors. Wisconsin companies have been forced to engage in more aggressive commercial combat with these competitors and also with domestic competitors.

Indeed, the quality of management may be the most important factor affecting the future health of Wisconsin's industrial economy.

While the quality of management in Wisconsin industries has always been important, this new world of competition has made it even more crucial. Indeed, the quality of management may be the most important factor affecting the future health of Wisconsin's industrial economy. If state companies are not well managed, they will not retain high-quality jobs.

This is true even in industries that are considered to be "dying." While some industries do actually die, in most cases the shrinkage is limited. For example, there will continue to be large markets for agricultural machinery in the U.S. and abroad. Some American companies will continue to be major suppliers to those markets; others will fail in those efforts. It is vital for Wisconsin to develop the stronger companies, even in contracting industries. Better an industry leader, even one with fewer employees than in the past, than none at all. The quality of management will largely determine industrial strength.

One of the most important attributes of quality management is greater responsiveness to changing market needs.

One of the most important attributes of quality management is greater responsiveness to changing market needs. Essential to quality management is:

- Greater attention to quality of product and people;
- Greater concern for productivity and cost control;
- Greater emphasis on long-term performance; and
- Emphasis on innovation and risk-taking.

Combined with these factors is the need for more effective use of technology to help ensure continued competitiveness. Increased use of technology on the factory floor and in the office is necessary if Wisconsin is to retain a large number of high-quality jobs. The alternative to the use of productivity-enhancing and quality-enhancing technology is the elimination of companies and jobs because of an inability and/or unwillingness to make investments necessary for continued strength.

The need for high-quality management and greater use of technology is not confined to manufacturing industries. All industries can and should take advantage of their benefits. Agriculture must make continued gains in these areas. As Dickson (1986), a University of Wisconsin (UW) professor wrote, "The future of Wisconsin dairying depends not on new technology, but on the ability of dairy farmers to adopt that technology and learn to manage it for maximum profitability."

Although the need for superior management is vital, labor also has a major responsibility for the future of working Wisconsin. The requirements for continuing efforts to contain costs and to improve quality, apply to both groups. Labor and management must share responsibility for improvements in these areas, and it should be possible to do so in less confrontational ways than have been demonstrated in recent cases.

Wisconsin can and should become known as a center for positive-sum solutions to industrial problems.

Beyond sharing responsibility for productivity and quality improvements, which sometimes require short-term sacrifices from both labor and management, it is important that both groups share the ultimate rewards of these efforts. Wisconsin can and should become known as a center for positive-sum solutions to industrial problems. Employees at all levels should share in the benefits of success resulting from common efforts.

The private sector has primary responsibility for the continued prosperity of Wisconsin's industrial base. Overwhelmingly, the actions of individual companies and their employees toward improving performance will make the most difference. Government, and especially state and local governments, have far less impact on regional economic health than many people in both private and public sectors admit. Constant tinkering with state taxes and reducing state spending to the average level of all states have relatively little impact on economic development. Wisconsin would be well-served by a significant lowering of the level of debate on these issues.

This is certainly not to say that government actions have no impact at all. The impact of *federal* policy on Wisconsin is great. The impact of badly-managed monetary and fiscal policies tends to have a disproportionate effect on manufacturing-based regional economies, as evidenced by the 1980 to 1982 recession on the Great Lakes' regional economy. Policies that work through their impact on interest rates and exchange rates have the potential for great harm--or good--for Wisconsin.

Reasons for Optimism

When all is considered, however, despite concerns about recent trends in fiscal policy, such as a dangerously large deficit, and despite the problems that have plagued many Wisconsin industries during the 1980s, there are still reasons for optimism in the 1990s that include:

- The nature of the problem has been recognized and, for the most part, is now becoming properly understood. Wisconsin and the nation are in the midst of global economic changes that can be rationally responded to, but not completely controlled. This is especially true at the state and local level.
- State companies are, perhaps belatedly in some cases, responding to the new competitive challenge. Many Wisconsin companies are industry leaders in terms of quality and productivity.
- Wisconsin has a number of industries that have remained strong and are expected to be growth sectors through the rest of the century. These include paper, printing, electrical equipment, and food processing.
- Wisconsin has strong public institutions to help provide the foundation for economic success. The UW system and the various attributes that contribute to the state's widely-known quality of life deserve to be singled out.

These factors suggest that the future of working Wisconsin's manufacturing style should be reasonably bright.

These factors suggest that the future of working Wisconsin's manufacturing style should be reasonably bright. The major caveat, however, is that success for companies or industries in terms of sales, market share, or profitability will not necessarily translate into large increases in employment in those sectors. The new competitiveness will not allow it.

To use another ungainly term, Wisconsin's manufacturing economy will be high-quality but "down-sized." Let us hope that smaller can, in fact, be beautiful.

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Future Skill Needs as seen by Harnischfeger Industries, Inc.

Larry D. De Master

Four score and seven years ago, Alonzo Pawling and Henry Harnischfeger met to look into the future. What products and skills would be required to carry their young machinery works into the 20th century?

This small company was poised to ride the rest of the industrial revolution, and after supplying its first overhead electric crane to the Charles P. Allis Company, the founders correctly identified cranes and hoists as basic building blocks of the industrial revolution. Cranes and hoists manufactured at their new rural plant at 44th and National Avenue in Milwaukee, Wisconsin, quickly became the backbone of their business.

Pauling and Harnischfeger never dreamed, however, that these products would carry the company for its first century of operation. Many other new products did not. Over 20 different products were actually built and abandoned including prefabricated homes, welding machines, and diesel engines during the first 100 years.

Flexibility was the key to operations then and flexibility remains the key today.

Flexibility was the key to operations then and flexibility remains the key today. In some ways, the future was easier for Pawling and Harnischfeger to see in 1900 than it is for us today. Even in 1977 Harnischfeger's future looked very different than it does today.

Growth of Harnischfeger

In 1977, Harnischfeger Corporation employed 7,500 workers in eight domestic manufacturing plants. These employees produced products for two divisions: 1) construction and mining and 2) material handling equipment. Sixty-five percent of these employees were hourly production workers; the remaining 35 percent were salaried sales, service, engineering, management, and support personnel.

The 1977 revenue figures showed major reliance on two products: 1) cranes for the nuclear power plant industry and 2) construction equipment. These two product groups provided one-half of the company's total revenue. Since then the Three Mile Island nuclear incident changed national energy policy, and the nation decided not to address decaying infrastructure problems.

Today, Harnischfeger Industries, Inc., a holding company formed in 1986, employs over 10,000 people. Forty percent are hourly production workers and 60 percent are salaried sales, service, engineering, management, and support personnel. The company operates four businesses:

- Beloit Corporation, which produces nearly half of the papermaking machinery used worldwide. It operates 17 manufacturing and "rebuild" facilities in the U.S., plus several foreign locations.
- Harnischfeger Corporation produces mining and material handling products. The corporation is a market leader with worldwide acceptance. It produces 75 percent of the world's electric mining shovels.
- Harnischfeger Engineers, Inc., and SYSCON represent the future. Already, these two business units provide 25 percent of the corporation's revenue.

Harnischfeger Engineers, Inc., provides computer integrated material handling systems for industrial and distribution businesses. These systems are provided on a turnkey basis and can be subsystems only, such as a single aisle Mini-Pik for small parts handling, up to completely-integrated material handling systems with computer interfaces, reporting to host computers at multiple levels within the user's corporate structure.

Systems such as General Electric's (GE) "Factory of the Future" in Lynn, Massachusetts, frees employees of much of the physical labor involved in receiving material, staging it for production, maintaining inventory records, procurement, and preparing finished goods for shipment to GE's customers. This system replaces muscle power with brain power as conveyors, overhead automated monorail systems, and automatic guided vehicles, all controlled by the systems' host computer, are integrated with the automated storage and retrieval system to feed this high-tech factory.

The Thermo-King Corporation in Minneapolis-St. Paul, replaced muscle power with a system designed and installed by Harnischfeger Engineers, Inc. They now employ brain power to operate the "worker-on-board" automated storage and retrieval system. Harnischfeger Engineers, Inc., also operates the warehouse host computer to update inventory records through cathode ray tube (CRT) data entry in its Mini-Pik stations, where thousands of small parts are securely stored awaiting use.

The SYSCON Corporation was acquired in 1986 and manufactures strategic software and tactical training programs for the nation's defense effort. Its software products include missile launch programs, tracking systems, and identification programs for approaching air and sea craft. SYSCON's largest customer is the U.S. Navy. SYSCON brings to the corporation, expertise in creating and managing large software projects and expertise in selling to the U.S. government.

SYSCON and Harnischfeger Engineers, Inc., combined, are able to provide large scale systems capabilities for government and industry and are currently pursuing major opportunities for future government systems.

Typical of these opportunities is the current system Harnischfeger Engineers, Inc., is installing for the U.S. Department of Defense in New Cumberland, Pennsylvania. This project is valued at $166.7 million. This joint venture with Morrison-Knutson Corporation and the Eaton Corporation will build a warehouse system with over 1 1/2 square miles under roof. Harnischfeger Engineers, Inc., is the equipment integrater and will provide the automated storage system, automated conveyors, and the world's largest towline systems.

The Future of Harnischfeger and Wisconsin Manufacturing

We see a future filled with prosperity, growth, and opportunity--a future where Wisconsin will build on its rich past to profitably meet worldwide industrial needs, while maintaining and improving the quality of life for its citizens.

The future of working Wisconsin depends on our ability to provide systems and facilities to meet citizens' needs in preparing for future challenges.

The future of working Wisconsin depends on our ability to provide systems and facilities to meet citizens' needs in preparing for future challenges. Three of Wisconsin's needs today are:

- The critical need for skilled technicians.
- The demands that will be placed on Wisconsin's training institutions. All public postsecondary schools, regardless of whether their curriculum leads to a degree are referred to as training institutions.
- The training needs of Wisconsin's future growth sector, which is small, independent business.

Need for Technicians. A society evolving from an industrial age to an information age requires technically skilled individuals to install, maintain, and update technological devices. Technicians already work for the manufacturers of these devices. They also already work for systems integrators like Harnischfeger Engineers, Inc., where technicians work in close partnership with automation and software engineers. They will also be employed by technological users in business, government, and public institutions.

The technician shortage is one reason that automation has not spread faster into American industry.

The technician shortage is one reason that automation has not spread faster into American industry. Trained, competent technicians are already in short supply, forcing most employers to provide internal, hands-on training. Future demands for these technicians will expand greatly. Public training systems should prepare now to meet this need; fully recognizing that these employees require lifelong training to keep up with ever-changing technology.

"Education as a lifetime process" is a theme I am certain applies to these technicians and to many other employees in Wisconsin's working future. Technicians' training must be specific, not generic. Public training institutions will either have to evolve to provide this training, or private institutions will continue to fill the void. As an example, specific, detailed, hands-on training is needed today on control devices like Allen Bradley's PLC-3, a Wisconsin product that is a leader in the programmable-logic controller industry.

In the near future, great emphasis must be placed on retraining Wisconsin's current workforce as blue collar, smokestack employment disappears.

Demands Placed on Training Institutions. Training institutions, too, face change. Managers at Harnischfeger Engineers, Inc., believe that training institutions are crucial to Wisconsin's future. In the near future, great emphasis must be placed on retraining Wisconsin's current workforce as blue collar, smokestack employment disappears. Industry and labor organizations must join together to provide direction and counseling so that today's workers can shed yesterday's skills and attitudes.

For the next 5 to 10 years, this retraining will occupy a major part of society's time and resources. Part of this retraining will expand the partnership of industry, labor, and training institutions leading to a future, where training institutions develop and conduct specific, hands-on training to meet this information age's technical needs.

A future partnership where individual employers and industries will have on-going, long-term programs with local training institutions that regularly train and retrain employees is Harnischfeger's hope. Labor shortages of all kinds in the next century will cause employers to enter into lifetime employment relationships with employees. Out of this lifetime relationship will come a commitment to provide whatever training is needed for achieving corporate goals.

Training institutions should develop a separate staff of corporate trainers whose full-time job would be training at company sites. This staff should be self-supporting from training revenues. It should not require public support for training or classrooms to exist.

The Harnischfeger Institute in New Berlin, Wisconsin, operates in this fashion today. The institute is a profit-making enterprise. It employs 14 full-time instructors who last year, trained 2,000 employees of other companies in maintenance and operation of equipment, safety practices, and management development; 110 of these 5-day courses were held at customer sites throughout the U.S., and 65 were held at the Harnischfeger Institute. Each instructor's classroom time is limited to 40 percent of total work time so they are able to learn new skills in the remaining 60 percent. Instructors spend a lot of time in engineering departments. Public training institutions could do the same and efficiently meet the training needs of smaller businesses.

Today, two-thirds of all new jobs in America are created by companies employing less that 20 people.

Small Business Growth. The third area and potentially the largest, where training institutions will positively influence change, is society's movement back to small business. Already today, two-thirds of all new jobs in America are created by companies employing less that 20 people. This trend will continue well into the next century. Wisconsin will benefit from this trend as business owners and new business launchers choose the quality of life Wisconsin offers.

In order to help its citizens participate in the growth of small business, Wisconsin's training institutions must develop ongoing programs in management skills, decision making, business operations, and the financial aspects of staffing, starting, and expanding a small business. A climate must be created that will produce business successes and provide economic benefits to Wisconsin through business and payroll taxes, as well as through gainful employment of its citizens. The training courses developed through these efforts should be made accessible to all Wisconsin's citizens through reproduction and low cost distribution in videotapes, computer disks, public broadcasting systems, and other technologies.

The future of working Wisconsin is indeed bright. That future will be aided greatly by the efforts of our training institutions. They will provide:

- The core of technicians needed to apply technology to the work place;

- The retraining necessary to keep workers' skills current;
- Partnership development for career-long training internal to specific business and industries; and
- The tools needed by today's small business leaders and the small business launchers of the future.

These efforts must be successful and can be if factions within society chose to unite in partnerships to meet the challenges ahead. I believe that this unity will occur, causing the future of working Wisconsin to be without limits--a place where future generations will know why we chose Wisconsin as our home.

Larry D. De Master is director of human resources for Harnischfeger Engineers, Inc., Milwaukee, Wisconsin.

SUMMARY OF PRESENTATIONS ON MANUFACTURING AND INDUSTRIAL DEVELOPMENT

Speakers: Jerry J. Jasinowski, Lisa C. Berman,
Kenneth S. Kinney, and Larry De Master

A discussion of manufacturing and industrial development requires consideration of cultural priorities and issues in addition to economics. The U.S. is actively involved in the global economy--70 percent of what is sold depends on international commerce. The way the U.S. competes in the world and the type of leadership attitude the nation takes are paramount issues. In looking at Wisconsin, world and national trade policies must be considered.

In both Wisconsin and the nation, manufacturing has been through a difficult time. These difficulties have apparently bottomed out, and although employment has declined, manufacturing output is at about its previous level of 25 percent of the gross national product. Many factors are influencing manufacturing worldwide such as high debt, tax policies, and defense spending. In terms of manufacturing, government should not choose winners and losers because the economy is too complicated. Wisconsin must maintain a diversified base of durable and nondurable product manufacturing.

One key to future economic growth is responding flexibly to market pressures, new product development, investment, and regulation. Target industries, not traditional industries, will maintain Wisconsin's economy.

Manufacturing continues to be Wisconsin's most important industry, employing about 30 percent of the state's workers. Since the late 1970s, however, the number of manufacturing jobs has decreased. Public policy makers as well as private decision makers must understand that Wisconsin will not return to its manufacturing glory days. Wisconsin is faced with real competition that has strained many of its businesses and increased the importance of quality management.

In order to adapt and remain competitive, Wisconsin must increase access to technology, provide a flexible, affordable and skilled workforce, build an adequate infrastructure of roads and utilities, and adequately promote the state. It must have capital available for investment and maintain an open entrepreneurial climate. In terms of working Wisconsin, automation, job transfer, and job loss must be considered because they will have a major impact on agricultural and manufacturing industries.

Manufacturing production is rebounding, but there will no longer be a strong correlation between strength of production and employment. The manufacturing sector will continue to be strong, but it will be a "down sized." Education must promote basic computation and communication, decision making, management, and technological skills to meet the challenge of competitiveness and to help Wisconsin adapt to the changing workforce and economy.

CRITICAL ASSUMPTIONS AND ISSUES RELEVANT TO MANUFACTURING AND INDUSTRIAL DEVELOPMENT

Assumption

Wisconsin industry must expand its world and national trade to maintain a sound economy.

Issue

What programs and services can be provided by the VTAE system to improve the world and national trade of Wisconsin industry?

Assumption

Wisconsin must maintain a diversified base of durable and nondurable product manufacturing.

Issues

How can the VTAE system assist in the formation and maintenance of small manufacturing businesses that produce durable or nondurable products?

How can the VTAE system support Wisconsin industry to obtain a larger share of defense and other federal contracts?

Assumption

The VTAE system will continue to be a major supply source for skilled workers for the manufacturing industry.

Issues

How can the VTAE system improve worker productivity and the quality of output of students?

What is the appropriate role of the VTAE system in technology transfer between the VTAE system, industry, and the UW system.
Should programs and services provided by the VTAE system for dislocated workers in manufacturing be expanded?

THE FUTURE OF WORKING
WISCONSIN

Agriculture, Agribusiness, and Biotechnology

In the past decade, there have been fundamental changes in the economic, social, and environmental context of American agriculture. Instead of a dramatic expansion of production to meet a growing foreign demand for farm products, the U.S. is now experiencing contraction of both demand for traditional agricultural products and a reduction in the value of the capital infrastructure that was built to support them. Rather than the luxury of a resource base that seemed capable of indefinite all-out production, there is concern that our continued indulgence will cause irreparable damage to the nation's precious soil and water resources.

Ralph E. Grossi
American Farmland Trust

Agriculture in Transition: Educational Challenges of the New Farm Management

Ralph E. Grossi

In the past decade, there have been fundamental changes in the economic, social, and environmental context of American agriculture. Instead of a dramatic expansion of production to meet a growing foreign demand for farm products, the U.S. is now experiencing a contraction of both demand for traditional agricultural products and a reduction in the value of the capital infrastructure that was built to support them. Rather than the luxury of a resource base that seemed capable of indefinite all-out production, there is concern that our continued indulgence will cause irreparable damage to the nation's precious soil and water resources.

Agriculture Today

In the mid-1980s, with a surplus of commodities, depressed farm income, an astronomical farm debt, and a host of environmental problems related to both overproduction and the cost-price squeeze, American agriculture is in transition. Gone, perhaps forever, are the days of boosterism, "bandwagon," fencerow-to-fencerow agriculture, when the success of family farms depended simply on the quickness with which they changed production to meet demands of the time and when farm management was guided by the principle of bigger is better.

Today, the transitional nature of agriculture demands that family farmers become more sophisticated managers if they wish to survive and if stability and profitability are to return to the U.S. food production system. The need for new farm management, in turn, poses a supreme challenge to our educational system.

Agriculture in the Future

Where do we want to be in the year 2000? What direction should American agriculture take as it continues to undergo the changes already set in motion? How can vocational education help family farmers lead us to a promising agricultural future?

The roots of the current agricultural transition were planted during the 1970s when U.S. farm production dramatically expanded to satisfy export markets. At the close of the decade, farm production began to contract again when those markets became more uncertain.

Without belaboring the cause and effect of these events, let it suffice to say that its legacy has been:

- Surplus of U.S. farm commodities;
- Excess capitalization in the agricultural sector, accompanied by over-extended farm credit;
- Shake-out of farm producers; and
- Misuse of land and water resources that threatens long-term productivity and has serious environmental impacts.

Each of these must be corrected if American agriculture is to regain a stable footing. The correction must take place with the least dislocation of the family farmers who are the core of our food production system.

In order to make these corrections, we must reduce the dependency of U.S. agriculture on export markets, debt-financed capital, and environmentally-harmful resource use. Formulating a prescription for achieving this will be difficult. Fundamental changes in production, farm structure, and land use must be considered. An essential ingredient will be more sophisticated farm management. A new farm management is needed that:

- Substitutes knowledge for brute force in attempting to cultivate new agriculture markets; and
- Marshals production resources and new technologies without waste or passing along the social costs of their use.

Vocational education can play a major role in contributing to the new farm management.

Vocational education can play a major role in contributing to the new farm management. However, production, farm structure, and land use must all be considered before this improvement can take place.

Production. At the close of the 1970s, when the agricultural transition began, export production accounted for about 30 percent of the annual gross receipts of U.S. farmers. This compared with only 15 percent during the previous decade. United States farm exports, such as major crops of wheat, feed grains, and soybeans, accounted for 19 percent of the total world agricultural trade. Since then, a 1 percent decline in our share of total world trade has meant a 5 percent decrease in U.S. gross receipts attributable to exports.

With this kind of leverage operating in a volatile global marketplace, American agriculture will remain vulnerable as long as it depends so heavily on an uncomfortably narrow slice of the marketplace.

In contrast, U.S. imports of agricultural commodities are significant and growing. For 1987, they are projected to be $21 billion, leaving the U.S. with an agricultural trade surplus of only about $5.5 billion. The demand for the food specialties, comprising the bulk of this market, presents an advantageous opportunity for domestic producers, whose output of fruits, vegetables, and other specialty crops now accounts for only about 10 percent of total annual U.S. agricultural sales.

To enable producers to identify and capture new markets and not simply rely on the old, they must be equipped with new management skills.

Diversification into specialty food crops for domestic consumption would appear to be at least part of the solution to American agriculture's over-dependence on export commodities. To take advantage of this opportunity, government subsidizing of standard export commodities production, which comprises two-thirds of all government farm outlays, must sooner or later be restructured to create an incentive for producers to shift to new crops. To enable producers to identify and capture new markets and not simply rely on the old, they must be equipped with new management skills.

Farm Structure. Total U.S. farm debt has quadrupled since 1970 to over $200 billion, the result of heavy borrowing to finance land and equipment purchases as farms expanded to increase production. With the contraction of our export markets, farm income has become insufficient to service this expanded debt. In turn, this has profound implications for both the structure of U.S. agriculture and that of individual family farms.

A shake out of producers, particularly younger operators who jumped onto the expansionist bandwagon, is now in progress. The larger, more highly-leveraged family farms that emerged from the expansion are under significant financial stress.

These circumstances present a number of challenges for both agricultural policy and vocational education. They include:

- The retirement of excess farm debt in a way that recognizes that producers, lenders, and government policymakers all contributed to over-extended debt, and that all segments of American society will benefit by its reduction. This implies a sharing of the cost, rather than insisting that stressed producers bear it all.

- Assurance that capital investment in agriculture is aimed at satisfying realistic demand for food and fiber. In the past, federal tax incentives to agricultural production played a role in its expansion beyond the ability of the marketplace to absorb it. The recent tax reform bill, which eliminated much of this kind of backdoor subsidy, was a welcome first step in preventing future overcapitalization.
- Retraining of those producers who were victims of the shake out. Promising areas for curricula in vocational education are the development and marketing of new crops and sophisticated farm management skills that can support the agricultural system through the transition period toward stability and provide new jobs for displaced farmers within their own communities.
- Vocational educators facing the challenge of teaching family farmers, especially those that are now highly-leveraged, to rely less on capital inputs to production, to make the most efficient use of essential inputs, and not simply to purchase more equipment or apply more fertilizer or chemicals than necessary. In short, training farmers in the new farm management that relies more on knowledge and less on physical strength is necessary.

Land Use. The expansion of farm production during the 1970s has been made possible in part by the exploitation of soil and water resources. Thousands of acres of marginal farmland were brought into production. Some of the acreage was comprised of fragile soils, the cultivation of which dramatically accelerated erosion, reducing its productivity and causing off-site damage to water resources through siltation and pollution. Other lands were brought under cultivation by irrigation that led to depletion of groundwater, notably in the Ogallala Aquifer region of the Southern Plains, and to soil salinization that reduced the land's fertility.

The lower inherent fertility of these marginal lands necessitated increased use of fertilizer and other agricultural chemicals, subjecting producers to the vulnerability of widely-fluctuating costs. Application in excess of amounts that land could absorb, contributed to environmental pollution of surface streams and groundwater, wildlife, and food for human consumption.

Reliance of this misused marginal land occurred simultaneously with the conversion of significant acreage of prime unique farmland to nonagricultural uses, especially near urban areas. Although a conclusion cannot be made that the misuse of the marginal lands was the direct result of this continuing conversion, the correlation has significant implications for the future of agriculture. Thirty percent of U.S. gross farm receipts from agricultural sales are earned by operations in the top-producing farm counties in or adjacent to metropolitan areas. Only 14 percent of the total amount of land used for farming in this country is considered to be in the most fertile category. Clearly, a disproportionate small amount of fertile land is used to produce almost one-third of our farm income.

The land use challenge for American agriculture in transition is to conserve these important farmlands that require the least capital input to cultivate and that are nearest to new markets.

The land use challenge for American agriculture in transition is to conserve these important farmlands that require the least capital input to cultivate and that are nearest to new markets. At the same time, retiring marginal lands from cultivation and reducing the environmental impacts of their misuse must take place. Sensible land use is the lynchpin of a policy and educational strategy aimed at achieving a stable agriculture based on shifting away from export markets and emphasizing efficient use of capital inputs and sustainable, environmentally-benign resource management.

It is in the land use area that the new farm management and the vocational education system responsible for its development, face their greatest challenge. Producers must be taught to view operations more holistically, recognize that proper resource maintenance can result in cost-efficiencies, and acknowledge that more sophisticated land use is the path leading away from the treadmill of intensive land abuse.

We Can Determine the Future

Since the establishment of the land grant colleges, research and education have played central roles in the development of the nation's agriculture. For more than a century, brainpower has been successful at harnessing horsepower--both literally and in the figurative sense of channeling the forces of technology and capital into productive growth. As American agriculture undergoes its latest transition, vocational education's challenge is to harness brainpower in order to add creativity and sophistication to the problems of locating new markets, managing more complex operations, and caring for the resource base that sustains our most vital industry. Only then can we nurture a new farm management, capable of taking agriculture into the 21st century.

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Biotechnology and Its Effect on Agriculture

Winston J. Brill

While biological discoveries have found applications in society over the millenia, new techniques are allowing scientists to consider applications that had never before been possible. This new biotechnology is only in its infancy, but there are strong indications that the technology will dramatically affect many aspects of our lives. Because of farming's importance in Wisconsin, agricultural biotechnology will have a significant effect on Wisconsin's future development. This paper will address opportunities that are available to the state in agricultural biotechnology.

Genetic Engineering

The discovery of genetic engineering in the early 1970s dramatically increased our ability to make and apply fine-tuned, genetic alterations in all organisms including animals, plants, and microorganisms.

Biotechnology is defined as the application of biological principles to benefit the public. Traditional beer and cheese production as well as animal and plant breeding all involve biotechnology. However, the discovery of genetic engineering in the early 1970s dramatically increased our ability to make and apply fine-tuned, genetic alterations in all organisms including animals, plants, and microorganisms.

To appreciate the power of genetic engineering, a simple understanding of genetics is essential. Every living cell has chromosomes. Chromosomes contain the genetic information that is passed on to newly-formed cells from one generation to the next. A chromosome contains thousands of genes, one next to the other like beads on a string. Each gene carries the genetic code for a single specific protein. Therefore, an organism contains thousands of different proteins. It is this protein collection that, produced in balanced amounts, allows an organism to live and gives the organism its specific characteristics. A tulip has a different protein collection, therefore, a different gene collection, than a mouse.

Genetic engineers can isolate a single, specific gene from one organism's chromosome and insert that gene into another organism's chromosome. As an example, scientists have added a human gene to bacteria to result in bacteria that produce their normal thousands of proteins, plus one more--a protein only found in humans. Likewise, genes from bacteria have been added to plant chromosome. The resulting plant will produce the additional bacterial protein as well as the plant's normal protein complement.

A genetically engineered experiment is relatively easy to perform. Several high school laboratories conduct genetically engineered experiments regularly. Unlike the physicist's work with atomic particles, genetic engineering does not require expensive equipment. Developing countries such as Mexico and the People's Republic of China have sophisticated laboratories applying biotechnology to agriculture. More scientifically-developed nations are aggressively competing with the U.S. in this area. Wisconsin needs to have individuals who understand biotechnology's potential for new opportunities in the state, as well as understand the competition that new products from other parts of the world will have on Wisconsin's traditional economic strengths.

By the beginning of the 21st century, biotechnology will have the potential to radically alter production methods in all agricultural areas.

Most of genetic engineering's early advances were in human health care. There have been fewer developments in agriculture, because more government funding has gone into medical areas. However, there has been renewed interest in agricultural projects in the past decade, with the University of Wisconsin (UW) becoming a leader in animal, plant, and microbial genetic engineering. By the beginning of the 21st century, biotechnology will have the potential to radically alter production methods in all agricultural areas. Individuals, states, and nations must assess their needs in light of opportunities and challenges that will develop from this technology.

Animal Agriculture

Biotechnology's primary focus on human health provided new and safer vaccines against virus and microbial diseases. Several biotechnologically-derived animal vaccines are currently on the market. New diagnostic kits test for diseases in animals before symptoms appear. In this way, it should be easier to treat animals and prevent spread of disease.

Growth Hormone. Human growth hormone was previously obtained in very minute amounts from the pituitary gland of human cadavers. Through a new genetically engineered bacterium, it can now be grown in large fermentation vessels (like those used for brewing beer). Children who are pituitary dwarfs are now more easily treated with this genetically engineered growth hormone. Biotechnology also provided new, specific, and very sensitive diagnostic tools, not only for diseases but also for genetic defects. Many of the ideas being applied to human health care are also considered for animal agriculture.

Successfully treating human dwarfs with genetically engineered, human growth hormone was the incentive to inject dairy cattle with bovine growth hormone. At Cornell University, (Bauman, Eppard, DeGeester, & Lanza, 1985) injected cattle produced from 20 to 40 percent more milk. As a result, it may be possible to use fewer cattle to produce the nation's milk needs and decrease the cost of milk production. The actual cost/benefit ratio from this technology is being carefully examined in a number of universities and industries. Presently, the growth hormone requires daily injections for it to be effective. However, scientists are developing implants that may be more practical for hormone administration.

There may be other animal hormones that can be made in large quantities by genetic engineering. For instance, future research may provide hormones that decrease fat, but increase the protein in meat. Other hormones may decrease fat content in milk.

With the extensive possibilities for using hormones in our food, it is important to point out that these hormones are proteins. Humans normally ingest these hormones while eating rare meat, and the digestive system breaks them down into nutrient amino acids. Thus, this technology is certainly safer than previous technologies that used steroids and other chemicals for animal agriculture.

Genetically Engineered Animals. In previous cases, a pure protein, isolated from fermenter-grown bacteria, was injected into animals. Another approach at the University of Pennsylvania (Palmiter, Brinster, Hammer, Trumbaer, Rosenfeld, Birnberg, & Evans, 1982), to inject the growth hormone gene into a fertilized mouse egg, helped open the way to genetically engineered animals. Some of the resulting baby mice grew twice as large as normal mice and this trait was carried on through the next generation. Around the world researchers started adding the growth hormone gene to the chromosomes of cows, pigs, fish, and chickens to increase growth rate or size. To date, no laboratory has reported increased growth from such genetically engineered animals, but positive results will certainly be seen within the next few years.

By genetically engineering animals, are scientists "playing God?"

By genetically engineering animals, are scientists "playing God?" Scientists have traditionally selected animals with genetic characteristics to fulfill our needs. In fact, by selective breeding for larger cattle, it is possible that cattle producing more growth hormone were naturally selected. Thus, genetic engineering is accomplishing through finely-tuned methods, that which could be done previously by crude methods.

Genetic engineers are able to place genes from any organism into an animal's chromosomes. However, most genes will detrimentally affect the animal, because they disrupt the fine protein balance needed for survival. In fact, it is likely that genetic engineers will not be able to place more than a few foreign genes in an organism and have that organism survive. For this reason, there are no prospects of engineering a cow with chicken genes to produce a cow that lays eggs.

Plant Agriculture

Perhaps biotechnology's greatest impact will be in improving plants and plant agricultural practices. Breeders are becoming limited in their ability to dramatically increase yields of major Wisconsin crops. Newspapers continually report on potentially dangerous pesticides that are present in food and drinking water and are clearly harmful to farmers who are exposed to them in high concentrations. Much of the fertilizer added to our farms and lawns is not taken up by plants, but flows into our lakes and streams after a heavy rain. This runoff is a major pollution source for these bodies of water. While genetic engineering will not quickly solve all of these problems, progress is being made in developing potential solutions.

Genetic Engineering to Decrease Herbicide Use. Within the past 2 years, scientists have genetically engineered plants resistant to certain types of caterpillars (Vaeck, Reynaerts, Hofte, Jansens, DeBeuckeleer, Dean, Zabeau, Van Montagu, & Leemans, 1987). When the caterpillar takes a bite from an altered leaf, the caterpillar dies. The leaf's toxic protein is coded by a gene originally isolated from a bacterial chromosome. Unlike chemical insecticides, the protein kills only the caterpillars and no other insects. It does not harm humans. Because the gene is incorporated into the plant's chromosome, subsequent plant generations will maintain the caterpillar-killing property and minimize the use of chemical insecticides. Other breakthroughs include genetically engineered plants resistant to viruses or bacterial diseases. These, like the caterpillar resistance, are specific to the target pest and are not toxic to humans. This is just the beginning of applying technology to plants.

Research is being conducted in a number of other areas as well. Food processing will be simplified by altering certain properties of the crop plant. It should be possible to optimize the soybean oil or protein content in the future. Corn may someday have increased nutritional value through genetically engineered seed proteins. Drought resistance is also being researched by genetic engineers.

Weeds are one of the major problems in agriculture. Many herbicides have health or nonspecificity problems associated with them. Several companies have genetically engineered plants resistant to herbicides (Fillatti, Kaiser, Rose, & Comai, 1987) and provided opportunities to use safer chemicals. With more herbicidal chemicals available through this technology, regulatory agencies will put greater pressure on companies to commercialize only those that are known to be safe.

Genetically Engineered Alfalfa Crops. There are millions of different plants on this planet, but alfalfa breeders are only interested in plants that will cross naturally with alfalfa. The alfalfa breeder is not interested in exotic trees or grasses. However, future crops in Wisconsin may very well have genes isolated from the chromosomes of such exotic plants. Thus, there is now even greater incentive to maintain wild plant species around the world. An example of a wild plant's potential value is a berry from Africa that contains a protein 100,000 times sweeter than sugar. The genes from that protein have been isolated. Will a sweeter alfalfa or corn be more palatable to farm animals in the future?

Because a gene from any organism can be added to a plant, it may be possible to grow plants, like alfalfa in Wisconsin, that produce commercially-important proteins such as protein detergents, now synthesized by bacteria, or even human insulin for diabetics. Enzymes, which are proteins, are increasingly being used for important industrial chemical reactions. If alfalfa plants contained a valuable protein in the juice that could be available by crushing, and if the remaining plant is still useful to feed animals, then genetically engineered alfalfa may have a far greater value.

Plant genetic engineering is much more predictable than many breeding crosses under experimentation in universities across the country. When two plants are bred with each other, the thousands of genes in each plant are randomly mixed. With genetic engineering, a single gene with predictable characteristics is added to the thousands of genes in the plant. Since modification is minor and because of the predictability of genetic engineering, there is less of a chance of a major problem arising from a genetically engineered plant than a new variety resulting from a breeding program.

Genetically Engineered Microorganisms. Most people are unaware that, since the late 1890s, microorganisms called inoculants have been used in U.S. agriculture to improve crop productivity. Thousands of inoculant strains have been grown in fermenters and added to soil in concentrations of billions per acre. The oldest inoculant company in the U.S. is The Nitragin Company, Inc., based in Milwaukee, Wisconsin. Some strains produced by this and other companies have been quite valuable. In fact, without such strains, neither soybean nor alfalfa would be grown in Wisconsin. Presently, scientists are using genetic engineering to produce inoculants that should decrease fertilizer use while increasing yield. Soybean and alfalfa production may be increased by inoculating the seeds with bacterial strains genetically modified to pull more nitrogen from the air and use it as fertilizer. Microorganisms are being genetically engineered to ward off plant pests. Based on a discovery made by plant pathologists at the UW, scientists in California have genetically engineered a bacterium that prevents plant damage by an early frost. Genetically engineered microorganisms are also being considered as possible weed-killing agents.

It is highly improbable that a genetic engineer, while trying to produce a microorganism valuable for agriculture, would inadvertently produce a serious pathogen.

There is concern about genetically engineered microorganisms, because they are invisible. However, of the hundreds of thousands of different microbial strains known, only a few cause problem diseases. Microbiologists have an excellent record of safety during their century-old inoculant practices. No problems have occurred and no one seems to be worried about future problems. Because the technology is new, the concern exists about the possibility of a serious problem from a safe organism containing one or two foreign genes. Much is known about microorganisms that are pathogens. They cause disease because the microorganism has many specific genes that are essential for causing and spreading disease. It is highly improbable that a genetic engineer, while trying to produce a microorganism valuable for agriculture, would inadvertently produce a serious pathogen. In the last 15 years, thousands of scientists around the world have been exposed to genetically altered microorganisms and there is no known case of a safe microorganism becoming a problem pathogen.

Implications for Wisconsin

Technology must be managed by individuals who understand its potential.

The national author and presenter for the agriculture, agribusiness, and biotechnology session of "The Future of Working Wisconsin" conference, Ralph Grossi (1987), touched on several important points that will influence agriculture over the next decades. As with the rest of the country, Wisconsin must conserve its soil and water. Current intensive farming practices tend to decrease fertility, increase erosion, and pollute waters. Chemical pesticides enter our drinking water and commonly contaminate food. Biotechnology offers a more environmentally-compatible agriculture. However, technology must be managed by individuals who understand its potential. The state's vocational and adult education programs should play a major role in determining the ways to optimally apply newly-available products and management tools to this technology.

While Wisconsin's agriculture is currently based on only a few major products, the state must be continually aware of new opportunities. Questions must be asked that include:

- Can alfalfa be used as an enzyme source that is required in a new chemical industry?
- Are there genes in exotic tropical plants that will increase the value of plants that can be grown in our climate?
- What new crops could be in demand 20 years from now, and how can Wisconsin be a production leader?
- Will Wisconsin remain a major dairy state?

Wisconsin must define its resources and use them to their full advantage in a manner that is compatible with the state's long-term future. The opportunities and challenges are enormous.

New concepts and techniques will be experimented with in Wisconsin's universities, technical and vocational schools, industries, farms, and homes. Education could easily make the difference between success and failure of future agriculture in Wisconsin.

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Prospectus of Wisconsin Agriculture: 1987 and in the Future

Mary L. Gunderson

Ralph Grossi (1987), national speaker for the agricultural session at "The Future of Working Wisconsin" conference, summarized the present transition in agriculture as mainly the result of being overcapitalized, over dependent on exports, and problematic in its impact on the environment and resource use. Furthermore, if an improved farm management system could be strategically implemented through the educational and policy initiatives that Grossi (1987) envisioned, the result might be the restructuring and restabilizing of production agriculture into a sustainable holistic mass.

I basically agree with Grossi's (1987) claims, but I disagree with some general statements made today about agriculture, in view of the complex issues and forces underlying its economy. This paper will address some of the issues concerning the present agricultural economy and discuss implications for Wisconsin.

Wisconsin at Present

Recent adjustments in agriculture, sometimes referred to as the farm crisis, are substantially reducing agriculture's overcapitalization.

Overcapitalization. Recent adjustments in agriculture, sometimes referred to as the farm crisis, are substantially reducing agriculture's overcapitalization. Estimates show that real asset values will need to decline 60 percent in Wisconsin. Nationally, about one-third of the $200 billion farm debt will be written off by lending institutions as uncollectable and nearly $300 billion in farmer equity will be lost before conditions improve. Farm land must be further reduced to solve excess capacity and overproduction problems. As a result, a sizable portion of full-time, high-debt farmers will be forced out of business.

In Wisconsin, we tend to be less overdeveloped in the production and manufacturing sector, than other regions of the country. Alternatively, we are seriously underdeveloped in our endowment of marketing capital and knowledge, but probably not any more so than other regions. Marketing strength can help build our agricultural economy.

Production. On the supply side for cash grain, livestock, and dairy sectors, national surpluses (excess capacity) cloud and dampen Wisconsin's farm earnings. Farmers' financial stress is compounded.

For instance, U.S. corn inventory stocks will be approximately 5.7 billion bushels in 1987; in 1982, 3.3 billion bushels were available. The 1982 level was enough to supply U.S. commercial needs without planting a kernel of corn this year.

Asset Values. Real asset values in land and machinery have declined in Wisconsin by about 50 percent since 1981. Farmers who had $150,000 equity in a $300,000 dairy farm in 1981, would likely have zero equity in 1987. Cash grain areas in the southern zone of Wisconsin were hardest hit, but dairy asset values also declined. The excess capacity problem in agriculture is affecting both export-dependent (cash grains) and nonexport-dependent (dairy) commodities, as a consequence.

Signs indicate that farm land devaluation has slowed, but it is not conclusive that agriculture has reached the trough of decline.

Signs indicate that farm land devaluation has slowed, but it is not conclusive that agriculture has reached the trough of decline. Certainly lower interest rates and lower farm energy input costs helped farmers in 1986.

Financial Stress. Figures show about one-third of our 80,000 farmers to be in a financial squeeze. Action taken at the national level will dictate survival for many of these farmers. Interest rates, dollar values, farm programs, farmers resiliency under adverse conditions, farm credit or debt restructuring initiatives, and the Chapter 12 bankruptcy law will all jointly effect the outcome of the farm problem. It is unlikely that farm programs will continue to supply nearly 50 percent of the net farm income, as they did in 1986.

Opportunity for Change

How can optimism be found? In Wisconsin, agriculture's prospects have been and are currently better than neighboring states.

How can optimism be found? In Wisconsin, agriculture's prospects have been and are currently better than neighboring states. The dairy industry has provided a strong base for agriculture's economic strength and helped avoid the worst of the farm depression. Dairy makes up 60 percent of farm cash receipts. Cheese sales, which grew by double digit percentages in 1986, comprise 72 percent of total dairy sales. Wisconsin also has substantial diversity outside the dairy industry with livestock, cash grains, fresh and canning vegetables, and specialty crops (such as cranberries and ginseng). This relative diversity has helped Wisconsin's economic success rise to greater levels than Iowa, Minnesota, and most other farm-belt states.

Wisconsin farmers must be efficient producers. Management abilities, which are improving with better knowledge and information, often determine success or failure.

Production Efficiency. Where can improvements be made? Wisconsin farmers must be efficient producers. Management abilities, which are improving with better knowledge and information, often determine success or failure. Wisconsin dairy farmers know they must reclaim the competitive edge that California and other regions have gained in recent years. Farmers realize that Wisconsin may have agriculturally overdeveloped in the 1970s, but they promise to be strong future competitors.

Diversification. If pursued carefully, Wisconsin's further agricultural diversification would be beneficial. The prospects for solving excess capacity and financial stress problems via specialty crop production are limited. These crops have narrow markets, require large capital investments in the beginning, and a financial commitment as they develop. For example, only 61,200 acres are required to grow all of the fresh cauliflower consumed in the U.S. Dane County alone has 239,000 acres planted in corn. That is not to say, however, that many opportunities do not exist or merit exploration for further diversification.

Marketing. Marketing, particularly value-added marketing of food commodities, presents tremendous opportunities to increase demand for Wisconsin agricultural commodities. In the past, many dairy and other food manufacturing plants in Wisconsin concentrated too much on manufacturing efficiency, while lacking emphasis of planning and executing marketing strategies. Several companies had no marketing plans because major companies like Borden or Kraft bought cheese directly from the factory or vegetable canners privately labeled cans for other companies. These Wisconsin companies worried little about wholesale-retail marketing and the distribution end of the business.

The Wisconsin dairy industry is pursuing a marketing attack on cheese consumers.

The Wisconsin dairy industry is pursuing a marketing attack on cheese consumers. Foreign investors are importing specialty cheese products and using marketing strategies to their advantage. Domestically, investment in research and development is increasing at very high rates, partially stimulated by foreign competition, dairy farmer research, and promotion efforts, and as a result of new found, market-driven optimism. Per capita cheese consumption is expected to be about 50 pounds by 1995. Optimists feel Wisconsin could produce 4 billion pounds of cheese worth $7 billion by 1995, if marketing efforts are properly exerted.

Exports. I would argue that export dependency is no more an agricultural sector problem than it is for nonagricultural sectors. Rather, the wringing out of inflation from our macroeconomy and the high budget deficits, have raised much more havoc than the real (and especially long-run) market demand problems have.

Part of the problem in evaluating the export dependency situation is the common mistake of using the peak level of agricultural exports seen in 1981 as the basis on which to judge performance. Using this measure leads individuals to misrepresent actual export capacity. United States grain exports are currently 20 to 50 percent above the 1972 to 1979 average and 9 to 13 percent above the 1973 to 1984 average. The U.S. still dominates several world trade market shares.

World Market Share of Corn, Soybeans, and Wheat Produced by the U.S.

Crop	1985 level, percent	Peak level, percent
Corn	55	79 (1979)
Soybeans	80	94 (1970)
Wheat	30	53 (1973)

Wisconsin, although impacted by the same trends as U.S. agricultural exports, compared well to other farm-belt states because of the importance of high-value (semiprocess and highly-processed goods) exports in our total agricultural export picture. Throughout the Midwest, Wisconsin demonstrates the highest proportion of high-value exports; these constitute about 50 percent of its total exports. Wisconsin also shows the steadiest growth in high-value exports, increasing 30 percent between 1975 and 1983. World trade in high-value farm products grew 17 percent per year during the 1970s to surpass trading of bulk products that traditionally dominated world agricultural trade. Optimistic projections are that the 1980 levels of high-value exports will triple by 1990. Wisconsin has great potential to capture the opportunities for high-value exports with proper packaging and execution of marketing strategies.

Reaching Wisconsin's Potential

Marketing is the art and finesse of placing the right product, packaged in the right way, and offered at the right time, to a predefined consumer.

Marketing is the art and finesse of placing the right product, packaged in the right way, and offered at the right time, to a predefined consumer. Marketing of products is the key to Wisconsin reaching its full agricultural potential. The production and manufacturing base needed to meet this challenge is in place, but marketing strategies need to be developed and implemented.

How can we achieve this? Long-term business and market development on formulating value-added food products is needed. Emphasis must be placed on formulating, testing, and packaging ideas that turn well-founded marketing strategies into action. The state could play a leadership and catalyst role in its own economic development by focusing on the food and agricultural industry. An equal challenge exits for educational institutions that serve agriculture. Analyses of competition, market trends, and domestic and international market segmentation need to be made. Because of a shift in consumer demographics and psychographics, the nature of basic foods and prepared foods has shifted considerably over the past 5 years. These cultural changes can either improve or negatively affect the producer's financial position.

In order to maintain and ultimately advance its economic standing, Wisconsin's agricultural industry must be in a position to capitalize on new and emerging opportunities as they arise.

In order to maintain and ultimately advance its economic standing, Wisconsin's agricultural industry must be in a position to capitalize on new and emerging opportunities as they arise. Enough time has been spent identifying the issues, now we need to take action to enhance our agricultural future.

Who will accept this challenge? Entrepreneurs will lead the way. These individuals are needed as farm managers, food manufacturers, cooperative managers, and marketers. They will help to precisely execute marketing strategies. Entrepreneurial development will occur partly because of survival needs in the rural economy, through examples set by others, or perhaps by incentives through state policies and programs.

We are currently uncovering this marketing potential and entrepreneurship. Entrepreneurs are responsible for development of:

- Speciality and international-type cheeses;
- Frozen vegetables, vegetables suitable for microwave cooking, and canned vegetables that look field-run green;
- New specialty crops like shiitake mushrooms;
- Trout-farming and other aquaculture; and
- Low fat, low cholesterol sausages.

Many Wisconsin food manufacturers are becoming more market oriented in order to distinguish themselves from the competition and to educate consumers about their products. We have opportunities to maintain our agricultural base at prosperous levels. To uncover and take advantage of these opportunities will require our best analytical and creative abilities devoted to marketing.

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Educating for Change

Russel R. Weisensel

Agriculture across the nation and in Wisconsin seems to be in the throws of a deep depression at this time. However, the situation is not without hope and potential economic recovery in the future. Publicists of the economic depression generally omit reference to the portion of Wisconsin agriculture that maintains economic viability. Both strengths and weaknesses will contribute to the challenge faced by agriculture in the future.

The agricultural depression is even more serious than the economic depression, because of the mindset that agriculture will never recover.

The agricultural depression is even more serious than the economic depression, because of the mindset that agriculture will never recover. This mindset negatively affects the politics of funding education and contributes to decreasing enrollments in agricultural education programs. The tragedy of this political depression is that it can be self fulfilling. Without enrollments and financial support, Wisconsin and the nation's agriculture, may have difficulty in maintaining its ability to compete with other areas of the world.

Agriculture Production Today Will Determine the Future

Forecasting for the Future. Forecasting the needs for agriculture in the 1990s and the first few decades of the 21st century is a formidable task. In 1977, the Joint Council on Food and Agricultural Sciences was established to assess these needs. Their (Joint Council on Food and Agricultural Sciences, 1984) long-term assessment projected a 30 to 40 percent increase in demand for U.S. grain production by the year 2000. This 1984 report (Joint Council on Food and Agricultural Sciences) followed the infamous 1983 payment-in-kind (PIK) program that paid farmers with commodities instead of cash for taking part of their land out of production. The PIK program reduced U.S. feed grain production by 50 percent, but since 1983 there has been a constant battle against over-supply and low prices.

Even "The Global 2000 Report to the President," published by the U.S. Council on Environmental Quality and the U.S. Department of State (Barney, 1980), contained statements like:

- Because of this tightening land constraint, food production is not likely to increase fast enough to meet rising demand.

- After decades of generally falling prices, the real price of food is projected to increase 95 percent over the 1970 to 2000 period.
- The U.S. is expected to continue its role as the world's principal food exporter.

By the time these reports were published, they were not forecasts, they were not even now-casts, but rather back-casts making predictions based on agriculture of the early 1970s.

An so it is today, like many of the television meteorologists who look at a computer printout and weakly put a percentage chance on what is going to happen tomorrow, but accurately quote what happened yesterday.

In 1798, Thomas R. Malthus, a British economist, predicted global starvation as the world population out striped our ability to increase the food supply (Farrell, 1983). Those who support this theory are often considered "Malthusians" while those who refer to the oversupply of food are quoted as "Cornucopians." Kenneth Farrell (1983), Director of the Food and Agricultural Policy Program of Resources for the Future, assessed agricultural politics as follows: "The Malthusians held court in the late 1970s; in the early 1980s the Cornucopians have staged a come back!"

Today, trends of organic, biosustainable, holistic, or low input agriculture, are popular political solutions that seem timely with surplus grains in the bins, financially squeezed farmers, and fear about the perceived risk of current and proposed technology.

A recent article in Wisconsin's Agriculturist (Hill, 1986) described a farmer who was successful in reducing herbicide use on most of his corn through crop rotation. This presented interesting scenarios. First, he noted that one weed would have "eaten up 19 acres" of his corn without the use of chemicals. Second, his method of farming would have required twice as many cattle in the state of Wisconsin if, on a statewide basis, his ratio of cattle to total corn planted was used, and 3 1/3 times more cattle if his ratio of cattle to corn upon which he needed no herbicide was used. The message: Low input has a price, too.

The challenge for vocational education is to be close enough to the current political trend to maintain viability and yet far enough in front of the trend to train those who will be needed in the business of food and fiber production, processing, and distribution for the coming decades.

"And It Came to Pass." Well over 30 bible verses begin with the phrase, "And It Came to Pass." The current philosophy of "produce only for the U.S." and the current economic and mental depression, like the aggressive agricultural years of the early 1970s will also pass. The challenge for vocational education is to be close enough to the current political trend to maintain viability and yet far enough in front of the trend to train those who will be needed in the business of food and fiber production, processing, and distribution for the coming decades.

The concept of slowing agricultural production to fulfill the demands of the nation's in-country consumption, misses a very important point. The U.S. functions in a world-wide economy. Tragic as it may be for some highly levered farmers, U.S. prices cannot artificially be kept high enough to maintain all who were in business in 1975. Even today at current prices, fresh fruits and vegetables are being imported into U.S. supermarkets from outside U.S. borders.

In Wisconsin, vegetables for processing come from other states and nations. As consumers, we will continue to look for the supplier who can consistently provide the quality we demand at the lowest price for the largest share of our food and fiber needs. The real danger that we invite from using protectionism, is the likelihood of even more food imports into the U.S.

Economics, politics, and subsidies all contribute to a complex set of factors that continue to change through time. No longer is the U.S. the only major provider of basic agricultural commodities as it was in the 1970s. In order to prepare for the 1990s and beyond, the educational and technical base must be strengthened so that the nation can remain competitive. If the nation's viability and standard of living is to be maintained, improvements in technology must be made. Protectionism did not work for the U.S. automobile industry or the steel industry, and it will not work for U.S. agriculture.

Those who advocate protectionism may want to look at the Canadian quota system for dairying. Canada instituted its quota system and by 1985 had only one-third the number of dairy farms it had in 1970. During that same 15-year period, the U.S. retained almost half of the number of dairy farms, while almost 63 percent of Wisconsin farms continued operation during the 1970 to 1985 period. Canada maintained its price, but apparently not its farmers.

Hope for the Future

Wisconsin needs to build on its strengths. In the upper Midwest we have a valuable resource of educated, well-equipped farmers. We have dependable transportation and educational systems. Our governmental system is stable, and land is cleared and fertile.

Wisconsin's strong agricultural industry will continue to be a major factor in our future economic growth, for instance:

- The Ore-Ida and American Potato companies moved processing plants into Wisconsin and in a decade, we went from 4.1 percent of the U.S. potato production to 6.8 percent. With new snap bean processing facilities and a bean breeding program supported by taxes, industry, and the University of Wisconsin (UW), snap bean production jumped from 20 to 35 percent of the U.S. supply.
- The special-fed veal industry moved into this state, utilized surplus dairy products (bull calves and nonfat dry milk), and created a demand for a new meat product. The result was an increase in Wisconsin's slaughter of calves from 292,000 in 1974 to 416,000 in 1984.
- Urban sprawl pressured the Long Island duckling industry, and Wisconsin now produces 30 percent of the nation's ducklings.
- During the recent Dairy Herd Buyout program, Wisconsin farmers chose not to reduce their herds as much as farmers in several other major dairy states. With over 74 percent of the state's milk going into cheese, an expanding demand for speciality cheeses, and the current dairy promotion, this is another asset in maintaining the diversity and strength of Wisconsin agriculture.

There are factors other than competition that will challenge agriculture and educators. Population, advances in biotechnology, and more personalized farming must be considered in the future.

Population. It is predicted that the world's population will soar to 6.2 billion people by the year 2000. That is an increase of 1.3 billion over the 1985 level. The U.S. Census Bureau's world population profile noted that in 1985, half of the world's people lived in China, India, the Soviet Union, and the U.S. The profile stated that people are living longer and that half of the population will live in cities by the year 2000 versus 29 percent in 1950. Not much food is grown in cities.

The world adds the equivalent of the population of the state of Wisconsin every 20 days. While their economies vary, these people will demand food and fiber.

Advances in Biotechnology. Paralleling the increase in population, however, are new areas of biotechnology that boggle the mind. These include:

- Testing of genetically-engineered bacterium in Wisconsin that will help alfalfa fix more atmospheric nitrogen for its own use;
- Synthetically producing animal protein that is likely to increase milk production by 15 percent;

- Production of an insulin-like product called encephalon that has been shown in tests to release growth hormones in animals without causing the release of any other pituitary hormones;
- Amplifying plant toxins to reduce the need for insecticides;
- Cloning of fast growing and disease-resistant trees;
- Experiments in increasing the occurrence of alleopathy, the chemical interaction in some plants that creates a natural herbicide;
- Genetically culturing crop plants to make them immune to particular herbicides to allow post-emergence application of a broad-spectrum contact herbicide; and
- Cloning of several proteins produced by plants for protection from heat stress.

Other advances in agricultural science are equally amazing. Magnetic identification tags on cows allow a computer controlled feeding system to provide more grain to high producers. Computer chips are now changing fertilizer and chemical application rates in the field from data recorded on infrared photography from satellites. Pherimones are used to attract insects into traps. Other growth factors are now beginning to be used to prevent certain insects from maturing to the reproduction stage. Super-ovulation of dairy cows and fertilized embryo transplants are commonplace.

Herbicides are becoming more sophisticated. Testing is being done on a compound that is sprayed on plants in the evening and literally causes plant cells to grow themselves to death the following day. There is no trace of this particular plant amino acid left when the plant dies. In the past, many pounds of chemical per acre were used to control certain weeds. The next selective herbicides require only a couple of pints or pounds per acre. Today, new compounds like this are effective at rates as low as 1/4 ounce per acre. These new materials often are virtually nontoxic, requiring only the Environmental Protection Agency (EPA) classification of "caution," similar to the warning on bubble bath.

With Wisconsin's short growing season and the fact that approximately 85 percent of the state's products are consumed outside of its borders, the high touch, direct, local market agriculture must be viewed in the proper context.

High Tech and High Touch. At a time when there is high technology, John Naisbitt (1982), author of Megatrends noted, that there is also "high touch" or hands-on in farming. For the farmers who have a ready market for fresh farm produce, or who are willing to invest time in certain speciality crops, this is indeed an important and growing economic factor. However, with Wisconsin's short growing season and the fact that approximately 85 percent of the state's products are consumed outside of its borders, the high touch, direct, local market agriculture must be viewed in the proper context.

The Challenge for Vocational Education

Wisconsin's agricultural diversity presents a special challenge to vocational education. Just look at the diversity in Wisconsin's wool production alone:

- A woman in Richland Center knits mittens from wool harvested from her own Angora rabbits.
- A Richland Center farmer has a flock of black sheep and specializes in producing garments with natural colors.
- In Columbus, a farmer has expanded a flock of 60 sheep into a wool carding business serving 200 customers nationwide. As a side benefit, the farmer's customers often buy some of her unique sheep for breeding purposes.
- A farmer has a 2,350 ewe flock in Bancroft.

Similar contrasts exist in every phase of Wisconsin agriculture. The vocational education system is faced with the challenge of providing programs and training future workers for this ever-changing field. Although this is a difficult challenge, it can be met. Modifications in several aspects of the educational system will help, for instance:

- Coordination of educational facilities must be increased to gain maximum utility from equipment and programs;
- Newly-integrated agricultural programs must fit the needs of the future. While each of Wisconsin's educational systems has a its own mission, the overall mission is to provide the skills and knowledge that society needs to survive and prosper. Talents and resources must be combined to provide the necessary technical and vocational skills.
- Curriculum must be carefully examined. Justifiably, there are certain language, science, and other skills required for graduation. The agricultural curriculum must be enhanced so that applied biological sciences taught in a vocational agriculture program, meet the standards for other science courses for graduation. This takes more than nomenclature change. Agriculture teachers must be trained to offer these courses and upgrade curriculum at both the secondary and postsecondary level. All of this must reflect new developments in the agricultural field itself.

- The general education system, as difficult as it may be to change, will have to consider an extension in either the school day, the school week, or the school year. We cannot continue to add to our human knowledge and requirements and expect to have this knowledge absorbed by our children in the ever shortening spans of time available for actual education.

It is encouraging that steps have already been taken to implement some of these modifications. The Wisconsin Agri-Business Council's Education Committee is working closely with the UW to articulate agricultural education curriculum in the upper Midwest. The group identified the following agri-business employment clusters ("Proposal submitted," 1987) during the past year for phase I of the project:

Agricultural science/production management
(including Horticulture)

Food science processing/food & fiber

Agri-marketing/distribution & retailing/services

Agricultural supplies & services/finance

Agricultural mech/engr & technical support services

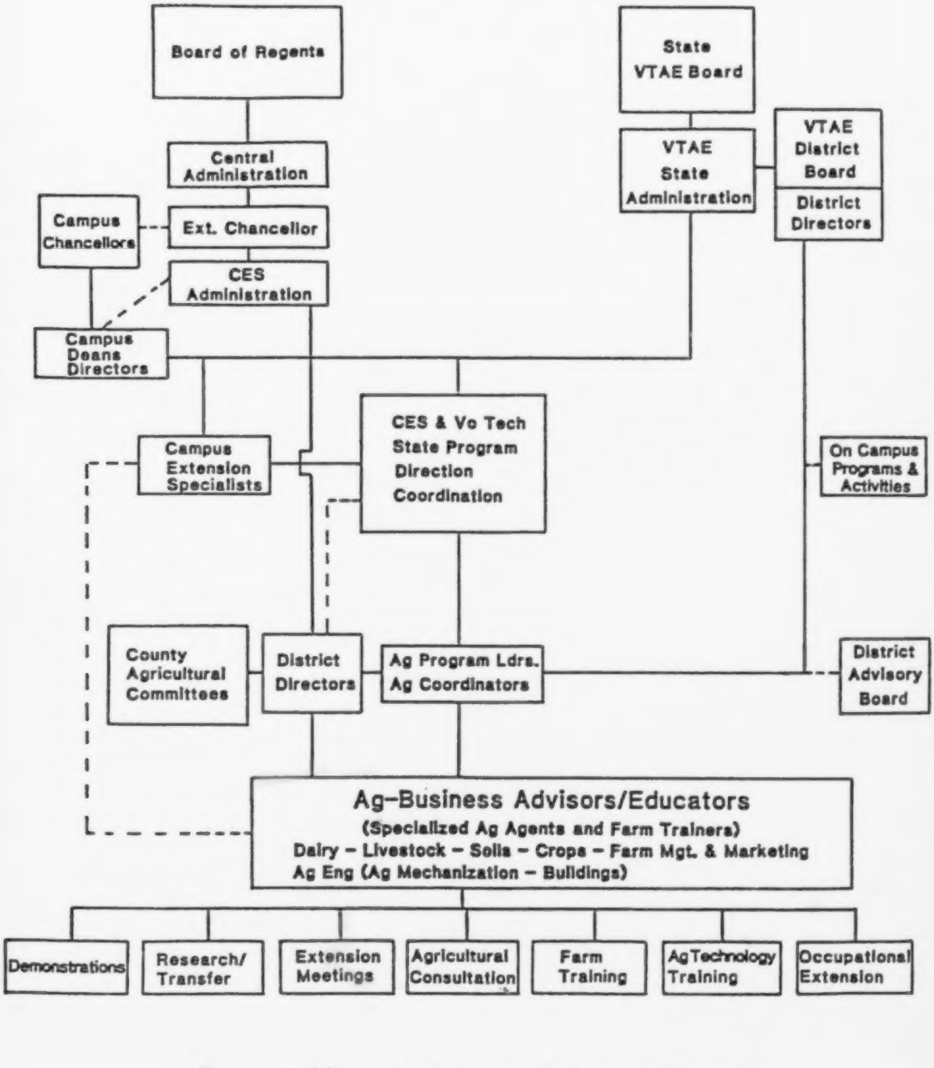
Agricultural resource management/forestry

Education/research/extension/communications government agencies
(i.e., regulatory)

Phase II, scheduled for July 1987 through June 1988 includes curriculum development and instructional materials. Phase III, covering a two year period beginning July, 1988 will deal with implementation. While these clusters provide a guide for education programming, a multitude of factors will dictate curriculum changes. Genetic engineering of plants, for example, may totally change our view of low-input or bio-sustainable agriculture in the next two decades. Students of all ages need to be prepared for a lifetime of continuing education that will enhance society's ability to respond to the inevitable changes in the future.

A recommendation to coordinate educational facilities on a statewide basis was outlined by the Wisconsin Dairy Task Force 1995 (1987). This was the first time that a formal network for coordinating agricultural education in Wisconsin was proposed. The network is shown on the following page.

NETWORK FOR COORDINATION OF AGRICULTURAL EXTENSION, EDUCATION, AND TECHNICAL TRAINING


Board of Regents
State VTAE Board
Central Administration
VTAE State Administration
VTAE District Board
District Directors
Campus Chancellors
Ext. Chancellor
CES Administration
Campus Deans Directors
CES & Vo Tech State Program Direction Coordination
Campus Extension Specialists
On Campus Programs & Activities
County Agricultural Committees
District Directors
Ag Program Ldrs. Ag Coordinators
District Advisory Board
Ag-Business Advisors/Educators
(Specialized Ag Agents and Farm Trainers)
Dairy - Livestock - Soils - Crops - Farm Mgt. & Marketing
Ag Eng (Ag Mechanization - Buildings)
Demonstrations
Research/ Transfer
Extension Meetings
Agricultural Consultation
Farm Training
Ag Technology Training
Occupational Extension

Source: Wisconsin Dairy Task Force 1995, 1987.

Although the employment clusters chart is a step in the right direction, I do not feel that it adequately prepares Wisconsin to meet the future demands of agriculture. Where and how in the postsecondary vocational system can we combine talents and resources to provide young people with the amount of technical and vocational skills needed to compete with Mexico, Korea, and India? How can we provide the high touch of carding and spinning wool and at the same time tap the universities for the new high tech skills of the future? The art of agriculture and the science of agriculture can be served by making available new integrated programs to fit the ever-changing needs.

I do not see politicians wanting to put the country back to the inflationary spiral where we were borrowing from our grandchildren in the hope that old bills could be paid with a greatly devalued dollar.

For the foreseeable future, I do not see politicians, either liberal or conservative, wanting to put the country back to the inflationary spiral where we were borrowing from our grandchildren in the hope that old bills could be paid with a greatly devalued dollar. Here again, education relating to agriculture may be hampered by the depression syndrome.

It is important to keep this depression in perspective and not allow perceived depression to be worse than the actual situation. Wisconsin's agricultural strengths proceed far beyond production. In 1985, Wisconsin marketed crops and livestock with a farm value of $5.1 billion. With profitability quite low, farmers spent almost $5 billion to raise that amount of produce. Then through processing, packaging, and distribution, an additional $10 billion was added. The result was a $20 billion dollar impact on this state's economy.

New agriculture will be a significant part of Wisconsin's economic employment future.

New agriculture will be a significant part of Wisconsin's economic employment future. More than 500,000 people or almost 22 percent of Wisconsin's workforce directly relies on agriculture for their livelihood.

The challenge for educators is to train the agri-business personnel needed for survival in the 1980s, stability in the 1990s, and sustained and substantial growth in the 21st century.

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SUMMARY OF PRESENTATIONS ON AGRICULTURE, AGRIBUSINESS, AND BIOTECHNOLOGY

Speakers: Ralph E. Grossi, Winston J. Brill,
Mary L. Gunderson, and Russel Weisensel

Agriculture and related businesses are in a transition from the previous decade. Although the long-term trend is expansion, there is movement away from the "bigger is better" concept. Farmers must become more sophisticated, use improved management techniques, and reduce capital expenditures. Vocational-technical education should provide training programs for farm management, teach farmers to better analyze and utilize their resources, provide entrepreneurial training, and retrain displaced farmers.

Genetic engineering is producing plants that are disease and insect-resistant; the inoculation of growth hormones and microorganisms increases growth and yield as well as improves food values. These food products will be safer than those they replace. The demand for technicians will accelerate in the biotechnology area. The VTAE system should consider extension of the instructional day, week, and year. Secondary agricultural biology should by strengthened to meet Carnegie unit requirements.

Wisconsin's agriculture is better off than in neighboring states; however, diversification into specialty crops and products should be pursued. Marketing must be expanded, and the VTAE system should assist organizations to develop marketing concepts--especially in the identification and development of new markets in today's global economy.

CRITICAL ASSUMPTIONS AND ISSUES RELEVANT TO AGRICULTURE, AGRIBUSINESS AND BIOTECHNOLOGY

Assumption

Agribusiness is in a period of transition with sophisticated management techniques and undercapitalization causing a large number of workers to become unemployable and in need of retraining.

Issues

Can at-risk persons be identified and trained prior to their becoming unemployed?

What can be done to initiate changes in federal programs for agriculture?

Should JTPA be involved in funding retraining efforts?

Can a core of general courses in areas such as computer technology, biotechnology, math, and communications be established in training agriculture students who are adaptable to a changing workforce and capable of pursuing continuing education opportunities?

How can the VTAE system best take advantage of the powerful agriculture lobbying force to improve funding for services to agriculture?

Assumption

Genetic engineering and trends in biotechnology will create many new products and new career opportunities in agribusiness.

Issues

What can our educational system do to assist agriculture entrepreneurs in developing successful new businesses in rural areas--turf management, paper and pulp industries, agriculture mechanics, pet grooming and small animal care, embryo transplantation, etc.?

How can the VTAE system adequately train and recruit students for the increased demand for biotechnology technicians? Can instruction keep pace with the rapid pace of new technology? What role can instructor/industry exchanges have?

What role does the VTAE system have in publicizing information about future trends and new careers in agriculture to elementary and secondary school counselors and students?

Is there a future role for space farming?

What can be done to assist agriculture to diversify into alternate crop production and the development of specialty crops and new products?

How can the VTAE system work with agribusiness and other educational institutions to create new linkages and avoid duplication in educational opportunities?

Assumption

Improved technology is causing a global food glut, which in turn is hurting the farm economy.

Issues

Will increasing the economy of developing countries increase food demand and improve world markets for food products?

What can be done to help local farmers acquire marketing skills to address the overseas markets for their products and to become more competitive?

To what extent should the VTAE system be involved in developing international programming?

What are the best ways to teach agribusiness students/workers to analyze and utilize resources using farm management and conservation practices?

THE FUTURE OF WORKING

WISCONSIN

Health Care Delivery

We stand on the threshold of a burgeoning health care system, one that has already changed more in the past 20 years than it had since the turn of the century. The changes we will see in the next 5 years are so mind boggling that we will find ourselves in a "whitewater" period in the evolution of health care.

Frederick J. Wenzel
Marshfield Clinic

The Future is Not What it Used to Be

Frederick J. Wenzel

We stand on the threshold of a burgeoning health care system, one that has already changed more in the past 20 years than it had since the turn of the century. The changes we will see in the next 5 years are so mind boggling that we will find ourselves in a "whitewater" period in the evolution of health care. On the far side of all this turbulence, we will enter the information age, an age when far-reaching technological advances will impact medical care, its people, delivery system, and costs. How these changes will be affected by the social consciousness of the American public and the priority given to quality health care for all is the "heart of the matter."

This paper will describe the current state of affairs within the health care field, speculate on the changes that might occur in the future, and discuss actions that can be taken to prepare for what is to come. A review and preview of health care in the context of the business, economic, and educational systems is necessary to support the future model. I will review a number of concepts and make certain assumptions about the health care system of the future on the national level. Such peripheral topics as professional liability or malpractice will not be addressed in this paper. While these are important concerns on both the local and national level, I believe they are outside the purview of this discussion.

How Much Do We Pay For Health Care?

For 1987, it is projected that $512 billion will be spent for health care.

Health care expenditures in the U.S. rose from $41.9 billion in 1965 to $465 billion in 1986. As a percent of the gross national product (GNP), the figure rose from 5.9 to 11.0 percent in that same period. For 1987, it is projected that $512 billion will be spent. Some economists speculate that health care expenditures, as a percent of the GNP, will drop in the 1990s, but even they predict a significant rise again in the early part of the 21st century.

The single largest component of overall health expenditures is on the hospital side, where 42 percent of the total dollars are consumed. Physicians costs and other components all contribute to the rising expenditures.

Health Care Expenditures

Cost	Total expenditure for health care, percent
Hospitals	42.0
Physicians	19.0
Nursing home care	8.5
Drugs and durable medical goods	7.0
Dental services	6.0
Administration of insurance programs	4.0
Construction	2.5
Other professional services	2.7
Eyeglasses and appliances	2.2
Other health services	6.1
	100.0

Source: Health Central Corporation, 1986.

The government accounts for 42 percent of total purchases of health services and goods. The majority, as might be expected, is spent on the Medicare and Medicaid programs.

Medicare Costs, 1983 to 1986

Year	Cost in billions
1983	$57
1984	62.5
1985	75
1986	85

Source: Health Central Corporation, 1986.

If all this leaves no impression on us as business leaders, health care providers, educators, legislators, or consumers, let us consider several key elements. First, technological advances will be so great and the percent of the aged population so high, that expenditures for health may reach a level of $2 trillion or 15 percent of the GNP by the year 2000. Second, most health care experts agree that the traditional fee-for-service system is dead, awaiting its burial. In its place have risen health maintenance organizations (HMOs), preferred practice organizations (PPOs), and managed care systems. In the next 5 years HMOs and PPOs will serve 65 percent of the population. Health maintenance organizations alone will account for 25 percent of the coverage. A third and final consideration is the competitive developments most prominent in the Midwest's major cities. Competition has come, and it is here to stay.

The patterns of health care expenditures are to some extent, a reflection of the nation's health and health care habits.

The patterns of health care expenditures are to some extent, a reflection of the nation's health and health care habits. David Mechanic (1986), in a discussion of the evolving health care system, suggested four points that should be considered along with traditional mortality and morbidity profiles. Resolution of the following issues must become matters of public policy.

- Death rates vary greatly by sex and age. Women for instance, live 7 years longer than men on average.
- Age adjusted death rates for major diseases in the U.S. have been falling, with the exception of cancer. Increases in cancer are principally associated with changes in smoking patterns.
- Although all groups in the population have benefited from downward trends in mortality rates, large differentials between males and females and white and nonwhites persist. Nonwhites and poor remain at greater risk.
- While many biological, environmental, and other factors contribute to the differentials by age and sex, factors associated with behavior clearly play a major role. Cigarette smoking, accidents, excessive drinking, and failure to maintain control over blood pressure, together account for massive increments in sickness and mortality.

Before continuing, it is important to remember that the cost of doing anything is not dollars. Dollars serve only as an exchange medium, like beads on a string. The cost of doing anything can be found in "choices." Hence, the cost of doing one thing means not being able to do another! It is that simple, or that complicated.

For society, the spectre of GNP costs reaching 15 or even 20 percent is not automatically bad. It depends upon the value placed on health and health care services by the public. Is health care valued relatively higher than, say incrementally more defense capacity? Is it more or less important than roadbuilding or public services? Are health and health care services, in our value system (present and future), on a par with education? Are they perhaps more important? Are they less important?

With finite dollars, but increasing technical ability and increasing demand due to an aging population, how we allocate fiscal resources will determine if the GNP figure for health care is "too expensive."

Choices, Choices. . . .

In other words, will we pay now or pay later?

Will we choose to change our habits as a society in order to reduce demands on the health care system? Will we forego tobacco, one of our leading killers. Will we "get in shape" and stay that way? Will we seek prophylaxis before high blood pressure and hyderlipidemia do us in? In other words, will we pay now or pay later?

It makes no difference whether the government controls and even delivers health care, or private enterprise is permitted to operate the system. Either way, there will still be costs, choices will have to be made, and scarce resources allocated. "The Future of Working Wisconsin" conference seeks to examine some of the principal areas in which decisions need to be made, and health care is one of the most important and most vexing of those decision areas.

The demands of future generations will bring unprecedented change to both the structure and function of the health care system. To bring the picture of tomorrow's health care system into sharper focus, the underpinnings of the industry itself must be understood. We must look inward, outward, and forward to prepare for the future health care system.

What will emerge after the dust of the 1980s settles? It is certain that as more insurers and hospitals join together to form "supermeds," the industry will take on an oligopolistic characteristic. Perhaps in the future there will be only a few vertically-integrated health care systems. In theory at least, they will control everything from financing to medical, hospital, and long-term care. The pundits speculate that these technological and financial giants will dictate the type of patient and illness a doctor will treat and the cost and location of treatment.

Ultimately, public policy will increasingly demand that "health care is a right" and the individual buyer will dictate the terms of quality and accessibility of that care.

All this assumed, our ability to exercise this measure of power may prove more apparent than real. We, the people, will personally be involved in the decision-making process. After all, when push comes to shove, and the individual is ill or has been in an accident, nothing is more important than high quality care. No amount of savings on health insurance or no cost of service is too high when a life is at stake. Ultimately, public policy will increasingly demand that "health care is a right" and the individual buyer will dictate the terms of quality and accessibility of that care.

When speculating on the future, let us remember that yesterday is gone, today is past, the future is here--and that the future is not what it used to be! With that in mind, we will examine the future of health care through five structural elements: payment systems, competition, technology, population composition, and information exchange. All are critical environments for change. All will influence--and be influenced by--public policy. For discussion purposes the relationship of the past and present to the future must be considered. The past will be defined as the period from the 1950s through the 1970s, the present extends from the 1980s until about the end of this decade, and the future is the 1990s and beyond.

Payment Systems

Cost-based System to Diagnostic Related Groupings. Health services were paid for in the past through cost-based and fee-for-service systems. Both have significant problems. In cost methods, the distribution of overhead and shifting cost from one population segment to another were problematic. Fee-for-service had little rational basis, and the economics that drove the system were uncharacteristic of any other business or industrial economic environment. New technology was expensive when it first came on the market and invariably remained so. More providers drove up the price of health care instead of down. Under these systems, total U.S. health expenditures doubled from 1976 to 1982. Until the early 1980s, no one really questioned cost; no one was concerned.

Federal officials felt the pinch first. In the early 1980s, the federal government shocked a complacent public by declaring that the Medicare Trust Fund would be bankrupt by 1987. This unsettling pronouncement stirred the U.S. Congress to action. A number of changes in the Medicare system were instituted, beginning with the now familiar diagnostic related groupings (DRGs) in 1983, and culminating with the Omnibus Budget Reconciliation Act of 1986. Overnight, the method of funding hospital care was changed from a cost-based system, fraught with inequities, to an equally troublesome DRG system. Nonspecificity of some diagnoses were not recognized by DRGs. As a result, problem cases associated with early discharge from hospitals were created. Initially, DRGs were a windfall for many hospitals. But government, aware of its largess, will likely tighten the system dramatically over the next several years. Predictions are that as many as one out of five hospitals will go out of business. Why? Because we have a significant excess of hospital beds. Most surely a tightly-controlled DRG system will make those closings occur.

From 1983 to 1985, hospital occupancy rates fell from 72 to 60 percent. For Medicare patients, the average length of stay fell from 9 days to 7.5 days. Even private pay lengths of stay fell from 5.8 to 5.4 days. It is clear that utilization of hospitals will be further controlled. However, will the shift from inpatient to outpatient care due to developing technology, really change or reduce total health care costs?

Health care experts say group practice will be the high-quality, brand name, health care consumers are demanding.

Group Practice Grows. We are witnessing a virtual explosion on the ambulatory or outpatient side with significant growth in both the number and size of single specialty and multidisciplinary physician clinics. There is little doubt that economics, the method for reimbursing services, and the hostility in the environment play major roles in the physician's decision to join a group practice. Group practices grew in size by 45 percent in the 15 years from 1969 to 1984. In just the last 2 years, the growth rate was more than 45 percent! In 4 short years from 1980 to 1984, the number of group practices grew from 10,762 to 15,485. The need for employees, especially those with university or technical school training, grew at the same or greater rates. The growth of these practices will make them one of the dominant forces in the delivery of care. Health care experts say group practice will be the high-quality, brand name, health care consumers are demanding. Think for a moment of the "Mayo model." The model is integration at its finest with three clinics, two hospitals, an HMO, medical school, research units, and graduate medical education, all under one roof.

A Capitation System. Physician reimbursement is under significant scrutiny. While DRGs have been suggested for physicians, it is believed that the concept will not survive for long. There is concern, however, because DRGs have crept into the budget bill's early drafts this year, placing payments for pathologists, radiologists, and anesthesiologists under the purview of the hospital DRG.

It is likely that a system of relative values, or "caps" on various services, will be the first to emerge. Either way, we can be sure that physician reimbursement, and consequently their salaries, are on the way down. The seed for the decline was firmly planted in the Medicare freeze of 1984 and will continue until at least the early 1990s.

As we move into the future, capitation systems, under which a specific payment per person per period of time is made, seem to be most promising. Capitation will probably be the financing mechanism of the future. Using this methodology, the population will be cared for at an established price.

There will be significant competition, including price competition, but the consumer will remain insistent on quality.

Capitation has the advantage of being predictable. It stresses health and wellness. Bids can be made for services, like other products in the marketplace. It is unfortunate that some suggest capitation may lead to reduced quality within the system. Those who have worked in capitated systems, as I have for 15 years, do not believe that to be the case. There will be significant competition, including price competition, but the consumer will remain insistent on quality. Providers, even in capitated systems, will be increasingly forced to not only describe their quality in print, but show it in action as well.

None of the payment systems suggested thus far have dealt effectively with health care for the near poor, the indigent, and the uninsured. It is estimated that there are approximately 35 million uninsured and underinsured Americans. We must look to the problem of the underinsured and the uninsured before government takes it in hand. Any system developed under federal control will be no better than the current systems for the poor. Wisconsin, however, should be commended for its two proposed pilot programs. The first is a proposal for the uninsured that has or will be presented to the Joint Finance Committee of the state legislature. The second is intended for Medicaid eligible individuals and offers incentives for them to return to work, even if only part-time. Experimental approaches are needed to encourage business and industry to insure their workers, while at the same time, involve them in their own health care through personal and economic commitment.

Competition

The trappings of competition are new to the health care system. We seem to have crossed the threshold from a seller's to a buyer's market, in about 1982. As evidence, the newspaper is full of advertisements from health-related institutions around the country.

Prior to the early 1980s it was felt that competition in the form of advertising was unethical in the health care sector. At that time California hospitals, in an effort to attract patients, began intense television advertising and marketing efforts that rapidly spread throughout the country. Recently, a newspaper ad included a coupon worth $100 for the first physical examination in a clinic located in Milwaukee, Wisconsin. Claims and counterclaims by various health care systems charging unfair competition and restraint of trade have also become commonplace.

Competition will continue, but hospitals, physicians, and large multidisciplinary clinics that are "in the know" will market services by spending most of their time "back in the shop," improving their quality of care.

Competition will continue, but hospitals, physicians, and large multidisciplinary clinics that are "in the know" will market services by spending most of their time "back in the shop," improving their quality of care. Those who are in a position to purchase health care will focus increasingly on "buying right." They will value real quality over low cost. Walter McClure (1985), a nationally known health care economist, stated that it is imperative that health care providers teach consumers how to be value-conscious purchasers. McClure (1985) stressed the importance of buying right into a high quality system. The best care is the right care at the right time. Short-run cost may be higher, but long-run costs will invariably be lower.

The consumer is the ultimate decision maker in the development of the health care system. He or she will insist on high quality. One of the elements of that insistence will be information on the outcome of medical care. This is apparent from the public's recent interest in mortality rates for open heart surgery. The U.S. Department of Health and Human Services published such data last year, to the consternation of some. Many believe that providers should be forced to publish death and complication rates with explanations about the numbers. Marginal programs with high mortality rates will not, and should not, survive under this level of scrutiny. As a result, competition as we know it today, is destined to continue and perhaps even intensify. The new battleground will be performance, not merely advertising the promise of performance.

Technology

Advances of the past 10 to 15 years will pale when compared to future innovations.

The surface has only been scratched in the development of new medical technology. Advances of the past 10 to 15 years will pale when compared to future innovations. In the past, we depended principally on technology developed in the hospital setting. The thesis in most cases was that the patient had to be in a bed to have major tests or treatment. Current thought is that computers and instrumentation should and will move these functions into the ambulatory care setting. Increased computerized tomography (CT) scanning, outpatient surgery, magnetic resonance imaging, lithotripsy, positron emission tomography, and other technologies will most often be found in the outpatient clinic.

The next round of technological advances will likely await our passing into the information age. This will probably not take place until the 1990s. We remain prisoners of a hard copy culture; one that will not likely allow us to exchange paper for ephemeral, transitory images or other forms of information transmission in the very near future. For this reason, we must wait for our collective traditions to change.

Technology and Information Advancements

Future technology will deal principally with genetic engineering and the installation of "spare parts." For example, we now possess the knowledge and technology to author genetic change. This has, and will have, significant impact on hereditary disease. Discoveries in this area in the last 2 to 3 years have given rise to new industries such as Genentec, Biogen, and others, now vying for their place in the sun.

Spare parts technology will be so successful by the end of this century or soon thereafter that there will be literally no organ or limb that cannot be replaced.

Control of chronic disease, leading to the aging of the population, will make organ transplants and bionic limbs commonplace, thus an extraordinarily significant part of health care costs. Spare parts technology will be so successful by the end of this century, or soon thereafter, that there will be literally no organ or limb that cannot be replaced. New discoveries in immunology and genetics will allow movement into this age sooner that most had predicted.

Caring for Aged. Developments in genetics and spare parts technology are within reach and will be accelerated by the changing composition of the population and the new economics associated with the era of the aged. Although Medicare, initiated in 1965, brought new emphasis on care for the aged, until recently it had little impact on the system as a whole. However, with the many advances in diagnoses and treatment, the impact is increasing. Several points to consider about future care for the aged include:

- The over age 65 population utilizes the system at rates 2 1/2 to 3 1/2 times that of their younger peers. The 78 million "baby boomers" will be about 50 years old by the year 2000. This group is currently making many decisions about those in the aged population. Between now and the turn of the century, the number of Americans age 85 and older will increase by 66 percent.
- We are dealing with a population that has shifted rapidly. At present, approximately 11 percent of the population is over age 65. That number will double early in the 21st century.
- Consider the impact of this changing population on our already overcrowded nursing homes. Home health care at this time has not solved the problem. Unless new approaches are used, it likely will not solve it in the future either. There is still time before the major upswing begins. The question is, will we have the foresight to act in time?
- The political and economic impact of the aged must be considered. The American Association of Retired Persons (AARP) has just begun to flex its muscles and increase its influence on its health care issues.

It is difficult to predict the political, economic, and technological impact of an aging population. However, this population will be significant and will change the entire system more than realized.

Information Exchange: Present and Future. Until the 1970s, information exchange and storage was principally accomplished on paper. Few health care organizations had computers or used automated systems of any kind. In the early 1970s, a dramatic shift began to take place. Now in the 1980s, the business of virtually every health care institution is controlled through computerized information systems. Computers have also been introduced into many of the new technologies used in diagnosis and treatment of patients.

Currently, health care and other industries are in the megaframe era. Most hospitals operate with large mainframe installations that will more than likely be used for a few more years. In the future, we will move toward interfaced or distributed systems with business systems and care systems linked. While there will always be a need to preserve and protect the main data base, there will be so many demands on the system that a network of computers interfaced with the "mainbrain" will be necessary. We are still in the beginning stages of computers talking to computers. The developments in the mini and micro series will be translated to mid-size information systems that will talk to the main data base.

Entire medical records will be automated. It is predicted that in the next 5 years, practical voice recognition and translation to digital data will be available. A transcriptionist will no longer be needed to type a record nor a records clerk, to file records. Transcriptionists will turn into editors; record room personnel into archivists. Instead of dealing with paper, they will deal with information.

The medical record will more than likely be carried in a chip imbedded in a person's wrist. The information will be accumulated from birth to death and will be read by instrumentation in any health care center.

As we look toward future technologies, it is possible to conceive of a system or hospital that has one nurse per floor and one physician per hospital. This system may become a center for spare parts replacement or ultra acute care. Biomedical technology and information systems will be coupled in such a way that patients will be completely monitored and, except for paying attention to the "human side of the enterprise," there will be little need for direct patient observation. Computers will direct diagnoses and control medication and treatments. Spending long hours to determine the most appropriate treatment for a patient will not be necessary. The medical record will more than likely be carried in a chip imbedded in a person's wrist. The information will be accumulated from birth to death and will be read by instrumentation in any health care center. Imagine entering the emergency room of a distant hospital and having your entire history available for the physician to review.

The Health Care System of the Future

The discussion thus far has suggested that the future health care system will be technologically competitive and based principally on high quality and efficiency. What effect this has on costs and management of the payment system, remains to be seen. There will be considerable constraints placed on the economics of the health care system. But capitation as a form of payment, through HMOs or other like financing mechanisms, can preserve quality while still controlling costs.

Another element that should be considered is the so-called glut of physicians on the horizon. The Graduate Medical Education and National Advisory Committee report (U.S. Department of Health and Human Services, 1981) predicted that the nation would have a surplus of 70,000 physicians, 13 percent more than required by 1990. The surplus will reach about 145,000, or 20 percent more than required, by the year 2000. The combination of these events is bound to have more than a minimal impact on the system as a whole. However, the strong influence that consumer demand for quality will have and the requirements of an aging population must be emphasized. Will it take fewer physicians to provide health care in the future? Actually, it may take more. In conventional economic systems, a surplus is almost certain to drive prices down. Historically, this has not been the case in the health care system. With new financing mechanisms and possible physician surpluses occurring at the same time, it is difficult to speculate about price.

Experts speculate that unless both quality and cost demands and expectations of the public are met, the possibility of national health insurance or a "public health utility" cannot be discounted. Most believe that there is potential at this time to make changes in the system that will render these concepts inappropriate or impossible. Private sector initiative and cooperation among providers, business, industry, and consumers can save us from a European or Canadian system.

There is no doubt that the most pressing public policy concern is to acknowledge that health care is America's number one priority.

Health Care Must be the Priority. There is no doubt that the most pressing public policy concern is to acknowledge that health care is America's number one priority. Time and time again we hear that the consumer has certain strong expectations. A recent editorial in the Wausau Record Herald ("Competition good," 1986) best expressed the public's sentiment toward health care:

> When you get right down to it, nothing is more important to a person than life and health. Not all the money or power in the world can help the dead. Even love, the most crucial ingredient of human life, can do no more than ease the pain and regret of the seriously ill and dying.
>
> That is why health care--quality health care--is critical for the people of a community. That is why people have elevated the healers in their society to a place of honor--and rewarded them with trust, near reverence, and highly respectable incomes.

A national network of providers, who hold quality and efficiency inviolate, must be developed. Prestige and emotionalism will have no place in such a system. Health is too important for institutions or communities to continue to argue over territory or resources. Battles being waged in health care are not being fought nationally, but at the local level, with unique "site specific" circumstances. America was built on the notion of free enterprise and determination, but there must be greater integration and organization of the system to produce a national health care resource for the year 2000 and beyond. The system is so expensive, the technology so complicated, and the future so filled with challenges, that significant attention must be paid to the greater good of the whole. This is resisted by many professionals, but there will be changes in the next 5 to 10 years that will make an organized approach to health care imperative. This evolution seemed impossible just a few years ago, but the signs indicate that it may well take place sooner than anticipated.

Government Must Make Appropriate Choices. The federal government should resist the temptation to regulate for the sake of regulation. Yet, it must accept responsibility for organizational development and integration. On society's behalf, the government should make choices that create opportunities and set operational constraints of the system as a whole. As a community, we must determine the amount of resources that should be spent on health care as compared to other needs. Mechanic (1986) suggested that communities should establish the priority given to:

> Researching and aggressively pursuing alternative disease and public health challenges, and the framework of equity that is to govern how a community's vast expenditures are to be allocated. It is through public dialogue, interest group activities, and the political and governmental process that these definitions become established and modified over time.

To date, government systems are quite inflexible in allowing the patient and physician to exercise options for illness. Most illnesses are not explicit enough to apply administrative decision making under governmental rule, to the treatment of the disease process.

Business and Industry Have a Role. The power of business and industry must be brought to bear on the problems of the uninsured and the underinsured. Governments should take responsibility for those who have no way to help themselves, but industry must provide adequate health insurance programs for their workers. Designing employment incentives for the near poor must be a task for the future. Business and industry must also involve workers, both personally and financially, in their own health care. There has been some progress here in the last 5 years, but we need more.

Health care is best delivered by a team of well-educated experienced workers. While skilled in application of high technology, these workers must also be trained in "high touch" skills, the combination so necessary to form an effective team.

Education's Responsibility. Educators must look to the future of training young people for new jobs and new professions in the health care system. They must look ahead to retraining those individuals currently employed in the system as their jobs change and eventually disappear. Health care is best delivered by a team of well-educated experienced workers. While skilled in application of high technology, these workers must also be trained in "high touch" skills, the combination so necessary to form an effective team. Sharp swings in the supply of and demand for key professionals must be considered by health care educators. The nursing profession has been a disaster for the last 25 years with cycles of glut and shortage out of control.

The vocational systems around the country have made significant attempts to deal with the problem of needs and numbers. In spite of early successes, more must be done in planning for the future of the health occupations. More attention must be paid to aging and new technology-related occupations. Graduates need a broader base to be successful in an occupation that will certainly change in the future.

To my knowledge the universities have not confronted these problems to any great extent. They should be challenged to deal with the issues facing the health care professionals they train. Universities have the ability to make rational predictions about the future and employment needs to appropriately serve the people of this country. But it does not stop there. The universities should also be challenged with developing ways to deal with the poor and the near poor and other critical issues facing health care. We need their help.

If America's good health is to be the number one priority, we must continue and intensify efforts to insure that this goal is met. In some way, large or small, all of us must be involved.

If America's good health is to be the number one priority, we must continue and intensify efforts to insure that this goal is met. In some way, large or small, all of us must be involved. We may have a hand in discovering new diagnostic or treatment systems, developing new educational programs, or devising innovative financing programs. Or our role may be as simple as deciding to make a personal commitment to our own health, such as wearing seat belts, stopping smoking, or paying attention to our blood pressure. For us to meet these challenges will take the work of many. Nothing will be achieved overnight.

The challenge belongs to all of us. My optimistic nature tells me that by working together, we can provide a quality health care system responsive to the needs of the future. Let us begin today.

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Home Health Care: The Future is Now

Aleta A. Barmore

This paper traces the history of home health care from the late 1800s to the present and provides a future perspective and prognosis, including personnel needs projections. Growth, competition, service array, population served, and funding for the home health care industry will be discussed.

The greatest shift in emphasis in home health care is the move from acute care to meeting the challenge of the elderly's long-term care needs.

The greatest shift in emphasis in home health care is the move from acute care to meeting the challenge of the elderly's long-term care needs. The industry is rapidly mobilizing to accomplish this goal, but in doing so, it needs assistance from the postsecondary education system.

Frederick Wenzel (1987), national speaker for "The Future of Working Wisconsin" conference's health care session, presented a comprehensive overview of the health care system from the past to the future. Wenzel's (1987) major points related to the technological impact of developments, shifts in funding, increases in competition, demand for quality expressed as value, and the aging of the population.

The observations presented here will express my substantial agreement with Wenzel (1987) and will show the parallel between his points and home health. In particular, I wish to underscore his (Wenzel, 1987) statement that within health care there is "turbulence." This appears to be particularly true in home health. Growth in the home health industry, the aging population, funding cutbacks, and search for appropriate personnel for diverse patient populations are causing the "whitewater period" Wenzel (1987) mentioned. A provocative statement from his (Wenzel, 1987) paper asserted that home health care has not solved the problem of overcrowded nursing homes. Wenzel (1987) further stated that, "Unless new approaches are used, it likely will not solve it in the future either." I believe that substantial progress is being made at this time to contradict that assertion.

Historical Perspective

Growth of Home Health Agencies. Home health care is the world's oldest health "institution." From the beginning, the central focus of care was in the home. In America, the world of home health care existed with families alone, and later with midwives, nurses, and doctors making housecalls. These services became formalized as visiting nurse associations, in the late 1800s and were only available in Wisconsin's metropolitan areas such as Madison, Milwaukee, Green Bay, Racine, and Kenosha. In the early 1900s, it became more fashionable and prestigious to be treated in hospitals, and home health care slowed.

Funding. Until the 1960s, consumers of home health care had to pay for services themselves, since government and other insurance plans provided no coverage. Hospital care was paid for by Medicare insurance and general relief at an actual cost to the provider; costs which continued to rise dramatically. In an effort to curtail rising institutional costs, Medicare established a home health benefit for acute care in 1966. This paid the home health provider the actual cost of the service, as determined by an annual cost report.

In 1977, the Wisconsin Legislature, at the encouragement of home health providers and with support of insurance companies, mandated that companies provide 40 home health visits in all disability insurance policies. Combined with Medicare, insurance guaranteed funding on a fee-for-service basis for those patients who met the coverage criteria.

The number of home health agencies in Wisconsin grew from 10 in 1900 to 87 in 1980.

The home health industry was launched. The number of home health agencies in Wisconsin grew from 10 in 1900 to 87 in 1980. The encouragement of the Wisconsin Department of Health and Social Services, through start-up grants, provided rural areas access to home health service for the first time. In metropolitan areas some for-profit agencies began operating as well. However, until 1980, most counties had only one home health agency in operation. Fifty new agencies have entered the marketplace in the past 6 years.

Services. Until 1970, the agencies primarily provided skilled nursing and home health aide services. Over the last 15 years, the array of services within home health agencies expanded from nursing and home health aide to agencies that offer physical, speech, and occupational therapy.

Services of Home Health Care Agencies, 1983-1984

Therapy service	Agencies that offer service, percent
Physical	91
Speech	59
Occupational	67

Source: Wisconsin Department of Health and Social Services, Division of Health, Center for Health Statistics, 1984.

Present Challenges

In 1983 and 1984, a new surge of activity began when 65 new home health agencies commenced operation in Wisconsin.

Growth of Home Health Agencies. In 1983 and 1984, a new surge of activity began when 65 new home health agencies commenced operation in Wisconsin. The majority of these were hospital-based agencies. Spurred on by the prospective payment system encouraging early discharge, hospitals needed to diversify and provide services that allowed more control over patients after discharge. This created the new phenomenon in home health care of competition for patients. Since approximately 60 percent of referrals to home care traditionally came from hospitals, the entrance of hospitals into the field threatened to reduce caseloads of existing freestanding agencies. Presently, 20 percent of the agencies are hospital owned or operated. In response, existing agencies began marketing and advertising services. These activities were considered unnecessary when a sole agency served a geographic area. Some contracted with public relations firms for billboards, radio and television ads, and elaborate brochures; others hired in-house public educators to perform marketing functions. Even agencies that were once content and complacent about their market share, upgraded outreach efforts.

Funding. Naturally, growth of this magnitude added pressure to already over-extended funding sources. Governmental and private insurance payers, while still paying for care on a fee-for-service basis, began changing eligibility criteria and severely restricting home health service to the most acute care patients. This occurred due to the increased demand for home health services placed on

Medicare and private insurance with the advent of the hospital prospective payment system. The cost of home health services to Medicare alone has increased from $60 million in 1962 (1.2 percent of the total benefit) to $2.3 billion in 1985 (3.3 percent of benefit levels), yielding an annual growth rate of 24 percent. The ripple effect has created a similar situation with Medicare and private insurance. Private insurance agencies are being asked to pick up where Medicare leaves off (Federal Council on Aging, 1985).

Population. Until 1983, no statewide data were collected that identified the population being served by home health care. The Wisconsin Department of Health and Social Service's, Center for Health Statistics was the first to begin collecting demographic information on home health agencies and patients. Despite this relatively short information history, growth in the number of patients served has been significant.

Growth in Number of Patients Served by Home Health Care, 1983 to 1985

Year	Persons served, number
1983	41,172
1984	46,689
1985	59,881

Source: Wisconsin Department of Health and Social Services, Div. of Health, Center for Health Statistics, 1984; 1985; 1986.

In just 1 year, from 1984 to 1985, home health agencies in Wisconsin served 28 percent more people than the previous year. This was the result of prospective payment for hospital care.

The age breakdown of patients currently served in home health care is shown on the following page. Seventy-eight percent of patients in 1985 were over age 65, and 58 percent were women. The utilization rate in the over 85 age group was 66 percent higher in 1985 than in 1984.

Age of Patients Served by Home Health Care

Age	Patients within age group, %
Age 17 and under	4.5
18-54	7.9
55-64	9.5
65-74	23.9
75-84	33.5
85-94	17.3
95+	3.3

Source: Wisconsin Department of Health and Human Services, Division of Health, Center for Health Statistics, 1986.

The most common diagnoses treated in home health care are cardiovascular disorders, cancer, diabetes, and fractures. A 65-year-old person's life expectancy is predicated to be 79.8 years for males and 84.5 years for females by the year 2000. Coupled with statistics from the American Association for Retired Persons (Cabin, 1986), which indicate that four out of five people over 65 have a least one chronic condition; it is obvious that we must respond quickly to long-term care needs. Home health care can and must be a viable alternative to institutional acute and long-term care.

A transformation is occurring in the home health industry at this time. In response to the combination of competition, funding cutbacks, and projected population demographics, the industry is rapidly mobilizing to meet this considerable challenge.

Dramatic Changes for the Future

Growth of Home Health Agencies. The number of home health agencies in Wisconsin will continue to increase slowly until 1989, when the capital expenditure review program for home health agencies sunsets. This statutory program regulates new agencies entering the marketplace through a formula that determines home health service needs. Presently, less than five counties show a need for another home health agency. This moratorium of sorts, coupled with the need for a strong cash base in light of reduced and uncertain funding and the hospital's desire to diversify, make the home health arena ripe for structural change and acquisition (Wisconsin Department of Health and Human Services, Division of Health, Bureau of Planning and Development, 1986).

Predictions are that there will be 10 to 12 megasystems in the U.S. by the year 2000.

The predicted "megasystems" are developing rapidly in metropolitan areas as freestanding agencies are "acquired" to one degree or another. Mergers, joint ventures, and acquisitions of new and expanded businesses are occurring daily. Predictions are that there will be 10 to 12 megasystems in the U.S. by the year 2000. In Wisconsin it is evident that the first step in this direction is taking place as hospitals form or acquire their own home health agencies.

Many groups have joined together for the first time to discuss and effect cooperative arrangements, mergers, joint ventures, or purchases. With the emerging megasystems, continuity of care can be a reality. As hospitals and home health agencies work more closely together and are interdependent, quality of patient care is bound to be high.

Services. Home health agencies are carefully examining the quality, price, and type of services they offer. The result has been planning for and initiating services that meet the demands and needs of consumers rather than the no-longer-predictable-or-reliable funding sources. To meet the need for home acute care brought about by early hospital discharges, home health agencies are rapidly developing expertise in use of new, high technology home equipment. These include renal dialysis, ventilators, intravenous medication infusion pumps, enteral and parental nutrition systems, apnea monitors, phototherapy, home diagnostics, and other equipment formerly administered in hospitals. Revenue from the home infusion therapy market alone is expected to triple from $850 million in 1986 to $2.8 billion in the next 4 years. The intravenous antibiotic market is expected to grow from $122 million in 1986 to $1.3 billion by 1990.

Having acute care services well-established, the most prevalent new services under development are for long-term care needs.

Having acute care services well-established, the most prevalent new services under development are for long-term care needs. These include: respite care for caregivers, durable medical equipment sales and service, homemaker attendants, companion services, "visiting friends," and hospice. These services are largely unfunded by government or private insurance companies. Hospice, as a concept of care, is just beginning to take hold in America. The public still conceives of hospice as a place or building, rather than a philosophy of providing palliative and supportive care for the dying. Home health care is the care of hospice, without the label. Recent changes in the Medicare law provide for certification and reimbursement of hospice services including bereavement, medical social work, and home health aide. The competitive arena and desire to offer these formerly noncovered services is causing many home health agencies to consider formalizing and augmenting their hospice service by becoming Medicare certified.

Funding. Funding for future home health services will change dramatically. As payment for hospital care shifted to a fixed, prospective system under Medicare, so too will health services. Presently, the federal government and several national associations are developing a prospective system that will be in concert with traditional service delivery and will consider the patient's functional level.

Health maintenance organizations or HMOs are also interested in capitated systems, whereby they pay home health agencies a fixed monthly rate based on the number of HMO subscribers. Utilization of home health service by HMOs is reportedly low at this time. This is largely due to HMOs having a younger, healthier population that often has family support to help through illnesses requiring home care. As the federal and state governments encourage enrollment of Medicare and Medicaid recipients, the patient mix in HMOs and the home health they provide will change dramatically. As these alternative delivery systems grow, home health agencies will experience disrupted referral patterns as the hospitals and primary physicians take a back seat to the HMO and preferred provider organization (PPO) medical review coordinators. There will be increased competition requiring sophisticated fiscal analysis and financial risk sharing. The HMOs will likely be interested in new services such as private nurses, post-surgical and post-delivery care that will substitute for institutional care.

Managed care and prior authorization, two means of reviewing care plans prior to service delivery, will be used increasingly as employers and private health plans strive for cost-containment.

Managed care and prior authorization, two means of reviewing care plans prior to service delivery, will be used increasingly as employers and private health plans strive for cost-containment. This will be advantageous to home health agencies as technology shortens hospital stays and follows people home.

As mentioned earlier, the traditional funding sources pay only for short-term acute care. A desperate need, however, is protection for chronic, debilitating conditions such as Alzheimer's Disease and

Multiple Sclerosis. Insurance companies avoid long-term insurance coverage because of their inability to predict utilization and to define policy parameters.

Wisconsin is exploring options for structuring long-term care insurance policies with home health care as the central focus. Elderly consumers attest to the fact that, "there is no place like home," and consumers will not purchase policies without home care. It is likely that a federal initiative will be needed before private insurance companies respond to this demand. This is most unfortunate, because the government generally provides what *it* wants to, not necessarily what the consumer wants or needs. The benefit would be more appropriate and reasonable if structured by consumers who pay the premium.

It appears that the federal government is slowly shifting health care to the private sector. Evidence of this is shown in:

- Recent requirements for employers to continue coverage for retired workers or spouses;
- Funneling of Medicare dollars through HMOs;
- Uniform benefit plans adopted in the Omnibus Budget Reconciliation Act of 1986;
- Proposals to establish medical individual retirement accounts (IRAs); and
- Requirements that employer benefit plans cover home and other services.

Quality assurance will take on new meaning and will become patient oriented as opposed to paper-work oriented.

As the private sector bears more of the cost of health care, it will demand more accountability. Quality assurance will take on new meaning and will become patient oriented as opposed to paper-work oriented. Critical review of the home health industry indicates that programs of licensing and accreditation have yet to develop patient outcome-oriented criteria.

The 1986 Omnibus Budget Reconciliation Act took the first step toward federal quality control by requiring professional review organizations to begin monitoring home health care patients as of October 1, 1987. The review system is just now being developed.

The single greatest challenge to home health agencies will be to hold costs within affordable levels at a time when demands for accountability, quality, and highly technical services are paramount in the minds of consumers and payers alike.

Changing technology, strongly expressed preference for home care versus institutional care, and the aging of the population are challenging administrators to realign their workforces.

Personnel. Changing technology, strongly expressed preference for home care versus institutional care, and the aging of the population are challenging administrators to realign their workforces. In demand are nurses with highly developed technical and assessment skills, trained home health aides, and trained nonprofessional individuals, who are honest, caring, reliable, and willing to perform mundane and perhaps undesirable tasks for ill or disabled people.

Postsecondary education systems need to reassess curricula in nursing to prepare students for future challenges in practice with focus on home-based service delivery. It is well recognized that home nursing practice is vastly different from that in institutions. There are national and state proposals to require Bachelor of Science in Nursing (BSN) preparation for home health nurses. The concern expressed by many in the home health industry is that the current curriculum for BSN contains less practicum and more theory than is appropriate for staff nurse positions. Although the training is needed by nursing supervisors, the fear is that staff nurses will not have the necessary technical skills.

Associate degree programs in vocational and technical education have traditionally emphasized the technical skills that agency directors are seeking in their caregiving staffs. There is recognition that BSN programs produce excellent patient care coordinators such as nurses with leadership, supervisory, teaching, and sophisticated decision-making abilities. In either approach, the hands-on skills are essential to home care delivery, and curricula must prepare nurses accordingly. Gribble (1987) predicted a glut of nurses due to hospital cutbacks. The predictions went awry. Metropolitan areas are experiencing a shortage of nurses. Enrollments in nursing programs are down between 8 and 30 percent from a few years ago. Some observers contend that the publicity about hospital layoffs deterred potential students from applying to nursing programs. Others believe that women, traditionally the nursing students, see other careers offering more mobility.

Home health aides have been trained principally by the Vocational, Technical, and Adult Education (VTAE) system in Wisconsin, although other private groups have recently begun offering short courses. The training curriculum for these aides varies in length from 160 to 300 hours, the core of which is generally the institutionally-oriented nursing assistant course. For some time, the home health industry has been attempting to scale back the program to a more reasonable 100 or so hours. Upon review, much of the institutional care of these lengthy courses can be consolidated or eliminated, because it does not directly apply to home health.

Although the prescribed level of home health aide training may be ideal, the reality of the delivery system is that payment sources pay very little for aide services.

Although the prescribed level of training may be ideal, the reality of the delivery system is that payment sources pay very little for aide services. Therefore, home health agencies cannot pay wages that are commensurate with individuals in other fields with the same type of training. Until costs and benefits of the home health aide's service are documented and proven to prevent more costly institutional care, and the buying public creates an overwhelming demand for services, third-party payers are unlikely to alter restrictive payments. In the meantime, a more realistic approach to training programs in the VTAE system is needed.

The third and emerging tier of home health service is the long-term care component. This component will require personnel with a minimal level of medical knowledge and ability to perform tasks that enable the elderly to remain at home. Many of these workers will come from society's healthy, retired segment and will be mostly women desiring to continue gainful, part-time employment. A tremendous pool of resources awaits this call to action. Training of these individuals can be accomplished through postsecondary education.

A comprehensive personnel needs and availability study within the state health arena could provide quantifiable data to document and guide curricula development. This seems particularly warranted in this turbulent time; to wait until things finally "settle," if ever, will be too late.

Just as home health care is changing, so must the educational system.

Just as home health care is changing, so must the educational system. Cooperation between home health providers, consumers, and educators can pave the way to meeting home health care's goal. Allowing a person to stay in his or her home in times of illness, injury, recuperation, or preparation for death is that goal.

Information Systems. Home health agencies are just now coming into the information age. Computer technology has been limited because of prohibitive costs. The more affordable minicomputers are just beginning to revolutionize billing and medical records. In the future, new computer technologies will be used for computerizing plans of treatment, charting, scheduling and data analysis, and management through new software program development.

The potential for applying information systems is limited more by imagination than by technology. If we accept the premise that professionals and paraprofessionals alike in home health, should work at the high end of their skills and cast off drudgery, the field is ripe for computer technology. Consider the human and machine relationship, wherein machines organize data according to pre-set rules, compile data, and present it in usable form to humans who use it to make decisions about care and treatment. Examples of future computer use in home care include:

- Transmission of physician orders and changes;
- Ordering of equipment and prescriptions;
- Access to centralized medical records from the field;
- Charting via modems;
- Accessing standard protocols for care from the field;
- Scheduling staff;
- Transmission of patient information to physicians; and
- Monitoring vital signs in patients who need occasional rather than ongoing assessments.

The field of home health care is on the cutting edge of technology. The transition to the future will depend on creative and innovative program development to meet long-term needs, ability to contain cost while meeting demands, and availability of appropriate personnel.

The future is now!

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Current Health Care Issues in Wisconsin: HMO Provider Perspective

Patrick R. Brady

The health care field has experienced dramatic changes over the past 20 years. Frederick Wenzel (1987), national speaker for "The Future of Working Wisconsin" conference's health care session, identified these changes and potential future changes. Transition within the health care industry makes an interesting scenario, with character's roles switching through the years. At the present time, I believe we are living in one of the most interesting chapters of the story.

Only 20 to 30 years ago, medical care was derogatorily categorized as a "cottage industry."

Only 20 to 30 years ago, medical care was derogatorily categorized as a "cottage industry." The physician was essentially a small business person who sold services at a pre-set price directly to consumers. The American Medical Association (AMA) was the physician's trade organization. The association used its power successfully to fight corporate involvement in medicine and to control supply and demand of health care services.

Times continued to change, however, with the onset of the Great Depression. Government and corporate health care payment systems became acceptable, because physicians were faced with empty waiting rooms, and patients were unable to pay for services. Politicians pushed for a national health insurance plan. Unions negotiated for health benefits as part of wage settlements. Industries recognized that healthy workers were "good for business," and health insurance was a legitimate employee need. Hospitals were also growing into powerful institutions. All of these factors led to the realization that physicians were losing some direct control over the health care marketplace. Other organizations were now acting as "the person in the middle" and demanding more from the physician.

Medicare and Medicaid programs, started in the 1960s, contributed to the growth of health care services. To meet some of the needs for greater service, the government spent large amounts of money on building new hospitals, medical schools, and training medical professionals. Rapid growth in health care inflation led to a health care crisis in the early 1970s.

President Nixon described public sentiment at that time when he told a press conference (Pace, 1987) in 1960 that:

> We face a massive crisis in this area. Unless action is taken within the next 2 or 3 years, we will have a breakdown in our medical system.

One solution, which the government finally embraced, was the Health Maintenance Organization (HMO) Act of 1973. The act provided $340 million for the development of HMOs that were essentially a hybrid of an insurance company and a health care provider organization.

The Growth of HMOs and Other Alternative Delivery Systems

Health maintenance organizations operate under a basic set of principles ruled by one common goal: To provide high quality care in a cost effective manner.

Health maintenance organizations operate under a basic set of principles ruled by one common goal: To provide high quality care in a cost effective manner. In the pursuit of this goal, HMOs must control the utilization of high cost hospital services, emphasize primary and preventive health care services, and serve as prudent purchasers of health care services for enrollees. Health maintenance organizations occupy a unique niche in the marketplace because they not only act as a traditional insurer, but also as a direct provider of health care services.

The HMO Act, along with other changes brought about by the health care crisis such as peer review organizations, health planning legislation, state legislation limiting expenditures in hospitals and nursing homes, all contributed to change in the power structure of the American health care system. This change was a major power shift from medical providers to the various consumers of health care.

The passage of the HMO Act did not set off a landslide of new HMOs being formed. In fact, only in the last 5 years has HMO development rapidly increased. There are now 595 HMOs (Interstudy, 1986). This represents a 51 percent growth from June 1985 to June 1986. Total enrollment in HMOs as of June 30, 1986, amounted to 23.7 million, up 25.2 percent over the previous 12 months.

Wisconsin HMOs have also grown dramatically in number and in members over the last 2 years. There are currently 38 HMO plans in Wisconsin; 27 of these are licensed independently and 11 are operated by insurance companies. In total, these plans had a membership of

927,000 individuals as of June 30, 1986, up 27,000 during the first 6 months of that year. Allegretti (1987) indicated than 19.6 percent of Wisconsin's population is enrolled in HMOs. I predict that this number will continue to grow.

One reason that HMOs have grown is because they are appealing to the consumer. Usually HMOs have fewer out-of-pocket costs and benefits are typically much better than those offered by competing indemnity plans. The employer's overall cost is usually lower. These factors, coupled with greater emphasis on prevention and wellness in HMO plans, means less employee time away from the job, less sick pay, and more employer side benefits. The Health Insurance Association of America predicts that by 1988, 14 percent of the U.S. population will be enrolled in an HMO, and an annual growth rate in excess of 20 percent is predicted for the industry.

There is little doubt that HMOs have had a substantial impact on the health care industry in the U.S. and in Wisconsin.

There is little doubt that HMOs have had a substantial impact on the health care industry in the U.S. and in Wisconsin. The length of stay in Wisconsin hospitals has decreased dramatically since 1981. In 1985, the average hospital stay for all patients was 6.1 days. For HMO patients, the national average was 4.7 days. Health maintenance organizations are not the only reason for this reduction, but certainly they caused a major portion of the decline. With the drop in the average length of stay, the occupancy rate in Wisconsin hospitals has also dropped from 68 percent in 1981 to 49 percent in 1985.

The shift to standard practices in HMOs such as out-patient or ambulatory surgery, free-standing urgent care centers, and home health care have all impacted hospitals and the delivery of medicine. Health maintenance organizations have proven that they can deliver quality care to members that equals that of the fee-for-service system, but which costs nearly one third less. The latest Rand Corporation study (1987), presented in a Group Health Association of America (GHAA) press release, showed that the HMO members of Group Health Cooperative of Puget Sound, Seattle, paid 28 percent less for their health care, due in large measure to a 40 percent reduction in hospital admissions. Significantly, the lower hospitalization rates did not affect members' health status. The study conducted over the past 12 years through an $80 million federally sponsored experiment compared the quality and cost of health care delivered by Group Health of Puget Sound with the area's fee-for-service providers. The report does not support previous Rand Corporation conclusions that suggested HMOs underserve the poor. Researchers found that income had no bearing on an HMO members' health status.

Health maintenance organization members tend to be more satisfied with their health care services, plan coverage, accessibility, and costs than comparable nonmembers. They are also more likely than the general public in HMO areas to be satisfied with the quality of doctors.

Competition seems to be the dominant force in the health care scene today and in the near future.

Competition seems to be the dominant force in the health care scene today and in the near future. Health maintenance organizations are now "slugging it out" for market shares. Acquisitions and mergers are commonplace. Large sums of money are spent on marketing, advertising, and public relations. Hospitals are also entering the competition arena. Television advertising for both HMOs and hospitals is abundant. Is it possible that a sizeable portion of health care savings earned on the delivery side are being spent on the advertising or marketing side?

Health maintenance organizations are beginning to place added emphasis on service issues as competition becomes more intense. Quality assurance programs in HMOs are receiving considerable attention from medical management teams. The Association of Wisconsin HMOs (1986) released a "white paper" that discussed emerging consumer-driven health care systems, in which purchasers of health care seek value, which is defined as the best combination of quality and cost.

The Rise of Preferred Provider Organizations

Preferred provider organizations (PPOs) are groups of hospitals and physicians contracted to provide comprehensive medical services to the plan's participants at negotiated rates. Preferred provider organizations provide incentives for all involved parties. If participants use "preferred" physicians and hospitals, they receive economic incentives, such as reduced or waived deductibles and lower coinsurance payments. In addition, participants can still use nonparticipating providers under their indemnity plan. Participating providers benefit by having more patients channeled to them by employers and insurance companies. The insurance company can offer an option to the traditional indemnity plan, which may reduce health care costs for the employer and the consumer. Specific market conditions have resulted in development of PPOs. Some feel that they are a marketing gimmick, but PPOs are achieving some degree of success and acceptance outside of Wisconsin.

A PPO differs from an HMO in two important ways. First, physicians are not at financial risk for patient care. All insurance portions of health care such as setting premiums, processing claims, or absorption of losses are still handled by the insurance company. Second, a federally-qualified HMO cannot offer a PPO product, because it violates the federal regulations governing HMOs, since the providers are not financially responsible for delivering health care.

There are about 450 PPOs now operating in this country, and the numbers will continue to grow. The ultimate test of PPOs' success will be measured by their ability to control costs without providers being committed to effective utilization review and shared risk.

The Future of the Health Care Industry

It is evident to me that managed care systems offer the only hope of slowing down the increasing cost spiral of providing health care to the U.S. population.

Managed care systems will be a permanent part of the health care industry's future. It is evident to me that they offer the only hope of slowing down the increasing cost spiral of providing health care to the U.S. population. The growth of HMOs should temporarily dampen the rate of health care cost inflation, but once the proportion of the population enrolled in HMOs levels off, the old rate of cost increases could resume unless tight utilization controls are instituted and enforced. Health maintenance organizations and other managed care plans appear to be in the best position to meet future health care needs, but other factors will also play a role in the industry's future.

Health Care for the Elderly. By the year 2000 it is predicated that 50 percent of all health care expenses will be related to the care and treatment of the over-65 population. This population presently comprises 12 percent of the U.S. population, but accounts for more than 25 percent of all prescriptions written, 33 percent of all hospital beds occupied, and 30 percent of all health bills paid.

The magnitude of providing health care for the elderly is virtually unknown. The cost potential is staggering. Unfortunately, the agenda for addressing this issue has not yet been developed.

Health Care for the Uninsured. Statistics indicated that between 1980 and 1985 the number of Americans without health insurance increased by 42 percent, to over 37 million (Easterbrook, 1987). In Wisconsin, approximately 442,000 residents lack health insurance. Some of the uninsured individuals in the U.S. could afford health insurance, but are acting irresponsibly. Most are the working poor, where 90 percent of the employed uninsured people are ineligible for coverage or work for firms that do not offer health insurance to employees.

Catastrophic Medical Insurance. United States Department of Health and Human Services Secretary Otis Bowen (Easterbrook, 1987) proposed that catastrophic coverage be included in Medicare, and that this coverage become a mandatory component of private insurance. The threat of having their life savings wiped out by a catastrophic illness is ever present in the elderly population. Bowen (Easterbrook, 1987) also proposed that financing for this coverage come from small monthly charge to Medicare eligible citizens. His proposals have a doubtful future since they were not well received by President Reagan.

Long-term Care. Although Medicaid is thought of as an acute care program for welfare families, because two-thirds of Medicaid recipients receive welfare benefits, more than 40 percent of all Medicaid expenditures are for long-term care. This is because Medicare and other insurers offer little nursing home coverage. States are becoming increasingly alarmed at the spiraling demand for long-term care stemming from the rapid growth in the elderly population.

Development of long-term care insurance may occur in the future, but the cost and benefits do not outweigh each other.

Development of long-term care insurance may occur in the future, but the cost and benefits do not outweigh each other. This concept will be another major agenda item for the future.

Wellness and Preventive Medicine. Easterbrook (1987) in a Newsweek article, stated that, "A motto of American medicine could be: Millions for cures, not one cent for prevention." The article (Easterbrook, 1987) calls for federal and private insurance providers to extend coverage for certain precautionary tests, particularly physicals and cancer screening. The result would be a short-run increase in expense, but a long-term savings to society as a whole.

The Seriousness of AIDS. The AIDS epidemic is perhaps the most immediate need to be addressed in this country and the world. It must be taken seriously, not only from a cost standpoint, where the average cost for a hospitalized AIDS patient ranges from $28,000 to approximately $147,000, but because it is a major health threat, and there is still no cure in sight.

Other issues impacting the cost of delivering future health care will receive considerable attention. Anticruelty care, uniform legal definitions of death, malpractice insurance costs, and sanctions against incompetent doctors are examples.

A Personal Viewpoint

I believe the health care industry and the HMO field in particular, will be characterized by price competition, vertical integration, mergers, and consolidations. Competitive differentials will focus on benefits packaging, delivery system convenience, market positioning, reputation, pricing, utilization controls, and most importantly, quality.

> *The reign of power in the health care marketplace will continue to shift even more from the provider to the purchaser and consumer.*

I also believe that the public will continue to join prepaid, managed health care plans in substantial numbers. Several experts have predicted that by the mid-1990s, HMOs and PPOs together will enroll between 60 and 70 percent of the privately-insured population. The reign of power in the health care marketplace will continue to shift even more from the provider to the purchaser and consumer.

An excerpt from Easterbrook's (1987) article best summarized the challenge for future quality health care. Easterbrook (1987) said, "Finally, we must learn to stop fearing change in medicine, since it has almost always been for the good." Easterbrook (1987) continued by quoting Thomas Lee, a cardiologist in Boston, who said, "The mood of the depression about health care is totally out of proportion to the actual situation. Nobody sensible would want to return to the medicine of even 5 years ago."

I agree with these statements and would add that the future of the health care delivery system may not be entirely clear, but we can guarantee that it will not be dull!

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Health Care Must Change if it is to Survive

Sister Julie Hanser

Significant questions about the delivery and costs of health care services, that have arisen over the past 5 years, are beginning to affect hospitals and their organization, management, and services. Large numbers of outpatient and ambulatory care centers were developed, responding to the demand for lower cost health care. I concur and generally agree with the basic tenets of Frederick Wenzel (1987), national speaker for "The Future of Working Wisconsin," health care session and executive director of Marshfield Clinic. However, Wenzel (1987) stated that professional liability and malpractice were peripheral issues. I feel that these issues are at the heart of service and behavior changes for health care professionals. My response focuses on future changes that will be necessary to slow the rise of health care costs and safeguard the use of precious resources.

Choices for the Future

Wenzel (1987) stressed "choices" as crucial for future health care. We are all responsible for the present condition of the health care delivery system, and the problems it has created. I believe that some of the answers to the problems rest with an understanding of the cultural habits that have developed in our country over the past 50 years. Wealth, convenience, instantaneous results, and a lack of self-discipline are characteristics of the problem. Choices! I believe we have made choices to support such short-term results for convenient and instantaneous results, rather than choices for long-term goals of good health.

If changing or reducing the amount of resources spent on health care services is a serious goal, individuals must be helped to make the right choices for health.

If changing or reducing the amount of resources spent on health care services is a serious goal, individuals must be helped to make the right choices for health. Each person must assume some degree of responsibility for his or her own health, and the dollars they spend on health care. The third-party mentality and the insurance models used throughout the past decades have insidiously lured us to sleep about the causes of some diseases and treatment costs.

Wenzel (1987) raised questions about individual choices: drunken drivers, accidents, and failure to maintain control over blood pressure. Another choice that individuals are faced with making every day concerns eating patterns. Excessive eating and poor eating habits that do not sustain health, are examples of poor choices. The solutions to reducing health care costs are very complex, but each person must assume part of the responsibility, at least for his or her own health.

The "Buy Right" Principle

Health care professionals need to teach the public to "buy right" by purchasing appropriate services and understanding their purchases.

Health care professionals need to teach the public to "buy right" by purchasing appropriate services and understanding their purchases. Morbidity and mortality rates are published by the federal government and other organizations. What do these statistics mean and what should the public know about health providers? I believe we need to concentrate our efforts on developing information about severity of illness, utilization control, and risk management. Why do certain diseases cost so much to treat? What are the real costs and risks, and what can we do to change the system?

Walter McClure (1985), president of the Center for Policy Studies in Minneapolis, Minnesota, described the buy right principle in this way:

> The heart of the buy right strategy is how it rewards provider efficiency. It rewards the efficient high quality provider with patients, not artificial bonuses. Thus, it requires that purchasers be able to assess the quality and efficiency of providers, and provide their employees with means and incentives to choose efficient providers.

When quality providers are asked to earn less on each patient, there is only one way to reward them--send them more patients.

I believe that we can change health care expenditures, but we will have to address the facts and choose to change before that happens.

Hospitals and health care professionals need to inform the public about health care expenditures and teach individuals to make appropriate choices. Hospitals must change from simply being providers of inpatient services to being providers of health care. If health care professionals teach wellness and health, the need for inpatient services will decrease. The most costly portion of these services will therefore diminish, and this in turn will force a change in the provider's behavior. I believe that we can change health care expenditures, but we will have to address the facts and choose to change before that happens.

Future Health Care Decisions

Hospital leaders, physicians, and allied health professionals are slowly learning to ask tough questions among themselves about results and outcomes of their services. Quality assessment within a hospital and health care organization must have several key components, including:

- Peer review for both physician and hospital personnel;
- Utilization review of resources;
- Concurrent review of services while patients are in the hospital; and
- Organization and structure to support change if deemed necessary.

Wisconsin is faced with an immediate decision regarding its health care delivery system. For the past decade, hospitals have been heavily regulated in this state. A debate of great magnitude is being waged as to whether or not these regulations have helped or hindered solving problems that exist. To solve this debate, we must describe the problems in the system today. There are unanswered questions about cost, access, use of resources, and empty hospital beds. I do not believe that regulation has helped solve the problems, because of the short-sighted approach of these regulations in establishing the rate, structure, and financial needs of hospitals.

Analysis by the Wisconsin Hospital Rate Setting Commission staff of the financial requirements to support a hospital rate increase, as well as the documented need for rate increases by hospitals, has been filled with inconsistencies. Both the commission and hospitals have overused strategies to build their own victories, rather than focus on patient needs and the need to have an effective health care delivery system. Therefore, I believe the competitive environment is conducive to refining the health care delivery system. Patient-responsive, cost effective, and quality health care providers will be best suited to meet the needs of the health care delivery system.

There are serious concerns about a strictly competitive environment if allowed to develop in health care. A major concern is the care for the poor and uninsured. If health care is based on competitive pricing and competition, who will be able to afford to take care of the poor? Several hospitals and health care systems have recognized this problem, but all health care organizations, the government, and society must continually work together toward a solution.

The state's current regulatory environment does not provide incentives or encourage creative responses to these problems. During the past few years, the Wisconsin Hospital Rate Setting Commission discouraged diversification of health care services. Reorganization by hospitals is an attempt to create solutions to the changes being demanded by health care purchasers. Hospitals in Wisconsin and other states responded to these demands by providing greater outpatient, ambulatory care, and home health care services. Most of these services were organized to be more effective and efficient than acute inpatient hospitals. Home health care corporations that were developed outside of the hospital structure have been able to be cost competitive.

There are unique economic factors that contribute to the rise of health care costs. In a Newsweek article (Easterbrook, 1987), Ed Stainback, a hospital administrator in Nashville, Tennessee, discussed the costs of providing health care to terminally ill patients:

> The question of putting a terminally ill elderly patient into intensive care comes up five or six times a month. Every one of those cases is a money loser for us.

This is only one facet of the rising health care expenditure problem that must be addressed before these costs can be lowered or at least stabilized.

Health Care Organizations Respond to Rising Costs

Health care organizations must assume a more active role in containing costs if in the future, there is to be a health care system with costs that individuals can afford and provisions for the poor.

Health care organizations must assume a more active role in containing costs if in the future, there is to be a health care system with costs that individuals can afford and provisions for the poor. Several organizations are already moving in this direction.

St. Mary's Hospital. Realizing that acute inpatient care was a high-cost program, St. Mary's Hospital in Milwaukee, Wisconsin, developed alternative programs addressing some of the cost problems. New services required reorganization within the hospital. In 1983, St. Mary's Hospital reorganized in an effort to become more flexible as a health care provider and to focus on needed outpatient services. Seton Health Corporation of Wisconsin was founded and formed the subsidiaries of Seton Health Care Services, which is a home health care provider service, and The Heart Institute of Milwaukee. These subsidiary corporations and others can provide health care services at lower costs, because their cost profile has been refined and the overhead of the acute-care hospital has been eliminated. There was excess capacity for inpatient health care at St. Mary's Hospital in 1983, but because of multiple changes in the organization and programs, the excess has been greatly diminished. The key to reducing costs in the health care system is changing the use of certain facilities and programs.

The Heart Institute. One example of enhancing programs to reduce costs is The Heart Institute of Milwaukee. It uses an industrial approach to assessing, monitoring, and managing the quality, effectiveness, and price efficiency of its medical services to consumers. Defining the quality of medical services is difficult, however, The Daughters of Charity Health System and The Heart Institute of Milwaukee employ both quantitative and qualitative methods of assessing, monitoring, and managing the quality and outcomes of services. The Heart Institute of Milwaukee uses the following management tools:

- MEDISGROUPS is a severity classification system that within certain confidence limits, is prognostic of a patient's clinical course. It is the baseline for measuring hospital and physician-specific performance in terms of patient outcomes (effectiveness), resource use (efficiency), and needs (appropriateness). MEDISGROUPS statistical validity and reliability are well documented and, from a user's perspective, are driven by clinical logic not statistical manipulation.

- "Effectiveness" analyses focus on improvements necessitated by patients that do not achieve the desired results as indicated by mortality and subsequent severity measures and identified medical practice.

- "Efficiency" analyses focus on patients that respond appropriately. These measures demonstrate variations in physician-specific resource use for homogenous patient groups with individual analyses available for The Heart Institute of Milwaukee contract businesses.

- "Appropriateness" analyses determine if there was clinical evidence justifying services such as hospitalization or surgery.

The cost of health care is a serious problem that every person must face. An aging population and rapidly advancing technology will contribute to this problem. The changes that will develop as a result of this problem will be beneficial and help in the continued development of the world's best health care systems. There are great challenges for the future of health care. I believe that due to multiple forces within and outside of the health care system, the industry will make the appropriate choices to provide quality health care to all.

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SUMMARY OF PRESENTATIONS ON HEALTH CARE DELIVERY

Speakers: Frederick J. Wenzel, Aleta A. Barmore,
Patrick R. Brady, and Sister Julie Hanser

In 1965, health care represented 5 percent of the gross national product (GNP); now, it comprises just over 11 percent and may increase to 15-20 percent of the GNP in the future. Of the total expenditures for health care, 42 percent is paid to hospitals and 19 percent to physicians; however, the government controls 43 percent of the payments. The traditional fee-for-service arrangements have diminished, as health maintenance organizations (HMOs) and preferred provider organizations (PPOs) gain control of 65 to 70 percent of health care costs. Because of the evolving structural/functional changes in the health care system, competition will continue among the various linked insurer and provider entities.

There are four significant long-term trends affecting the health care delivery system. First, the payment mechanism will change. Diagnostic related groups (DRGs), which replaced the cost-basis of payment, will increasingly be applied to outpatient care to stem cost increases. National healthcare expenditures doubled from 1976 to 1982, while hospital occupancy declined from 72 to 60 percent. As a result, capitation will increasingly be used as the payment system and group physician practice--which grew faster from 1984 to 1986 than in the previous 15 years--will become the norm. Second, competition will accelerate, especially in terms of quality, performance, and accessibility. Third, both patient care and information technology will become more important. Technology is moving into ambulatory settings away from hospitals. Genetic engineering and the installation of "spare parts" (especially organ transplants and bionic limbs) will become increasingly common. Patient information will move from large mainframe computers to distributed data processing situations. Fourth, the population is aging. Those over the age of 65 now represent 11 percent of the population; by the year 2000 this percentage will double. In order to cope with these continuing trends, the government must integrate and impose restraints on the health care delivery system, provide for the underinsured, and decrease variations in the supply and demand of health care professionals.

The home health care industry's greatest growth--from around 100 to over 160 Wisconsin entities between 1983 and 1984--has been due to hospital-based organizations and the prospective payments of DRGs. The focus is now on acute care, but increasingly it will be on the long-term needs of the elderly, since 78 percent of patients are over age 65. Services are moving toward high technology, as well as supportive managed care, where private firms train home health aides in shorter, more competitive programs than those provided by the VTAE system. The fee structure is increasingly becoming pre-paid capitation as well as more price competitive. The continuing issue is to furnish quality at a reasonable cost. Training needs are both highly technical and oriented to assessment techniques.

The Federal Health Maintenance Act of 1973 shifted the emphasis from providers to consumers in response to ever-increasing costs. As a result of this shift, HMO and PPO costs are one-third less than the traditional fee-for-service expense, and the Wisconsin hospital occupancy rate is down to 49 percent. The emphasis is on service issues, such as managed care systems, along with increasing price competition and vertical integration. However, individuals must assume more responsibility for both their own wellness as well as overall health care costs.

CRITICAL ASSUMPTIONS AND ISSUES RELEVANT TO HEALTH CARE DELIVERY

Assumption

Diagnostic related groups (DRGs) will continue to replace the cost-basis of payment for health care in order to stem cost increases.

Issues

How will cost containment efforts effect the need for home health care and after care (care given after dismissal from health care facilities) workers?

Will increased concern over the number of uninsured individuals lead to some form of national health care insurance?

Assumption

Competition will increase based on quality, performance, and accessibility.

Issues

The health care industry will press for differentiation in health care certification. What will be the role of the two, three, or four-year RN degree?

Will competition have an adverse effect on salaries for health care workers?

Will the public and private sectors compete to train health care workers? How can greater coordination between groups be initiated?

Will exit requirements or educational competencies increase the rigor of health care training programs and licensing standards?

As quality control is critical in the health care field, how can we insure that standards will be maintained in light of increased competition?

Assumption

The health care delivery system will be forced to change in order to meet demands from the growing elderly population.

Issues

Will clinical training sites be sufficient to train health care workers?

Will patient care be impacted?

Will the VTAE system's access to advancing technology in health sciences be limited by changes in clinical sites and health care delivery?

Assumption

New technology and patient care information will play important roles in future health care.

Issues

Will the educational clustering concept, which requires a basic core of courses followed by more specialized courses, be a method of training that allows health care workers to adapt to changing technologies?

Will computer literacy, health terminology, and communication skills be required basic skills for a health career?

Can health care providers and educational institutions provide learning resource centers for upgrading and continued education of employees?

Will technical, intern-type, co-op training arrangements be required that will allow educators to maintain work experience? Will this lead to new industry/education partnerships?

Will DRGs lead to more literacy in computer, communications, analytical skills, etc., and how will educational agencies adapt to these requirements?

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THE FUTURE OF WORKING WISCONSIN

Service Industries

The service sector is a strong and pervasive force in our economic system, but many people do not realize the significant role it plays. They claim that if we do not generate manufacturing jobs that produce hard products, we are simply taking in each others laundry and living on a weak base. That is absolutely not true.

Joseph W. Duncan
The Dun & Bradstreet Corporation

019

The Role of Services in the U.S. Economy

This text was edited from a presentation made by Joseph W. Duncan at "The Future of Working Wisconsin" conference.

My assignment is to discuss the role of the services sector in the U.S. economy. There are many different definitions of services. This makes the definition of the service sector a complex subject. Therefore, I will begin by providing a broad overview of services and the present system of industry classification.

In the U.S., occupations and industries are classified according to the Standard Industrial Classification (SIC), which is a system that is woefully out of date with respect to the actual operation of our economy. For example, the SIC identifies computers as "non-electric machinery" because originally they were mostly mechanical punch card, tabulating machines.

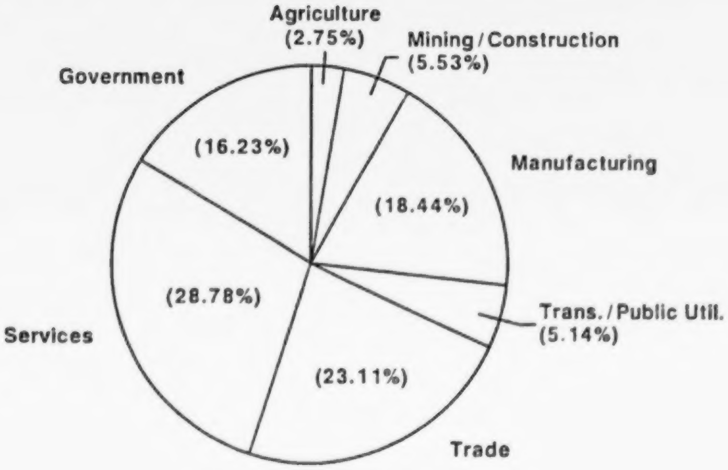
Because current methods for measuring the service sector are based on this outdated classification system, the measures are also inadequate. Although inadequate, we must be able to use SIC information in designing curriculum or guiding people into meaningful occupations in the rapidly-growing services area. As Ronald Kutscher (1987) of the U.S. Bureau of Labor Statistics (BLS) stated, "In current business expansion, 90 percent of the new job growth has been identified as service activities." That is part of the reason that so many individuals want to learn more about the service sector.

What is the Service Sector?

Over the years the service sector has evolved into a "catch all" for those jobs outside the fields of manufacturing, agriculture, mining, and construction. Jobs now classified within the service sector were appropriately classified as manufacturing 10 to 20 years ago. The trend toward vertical integration that characterized the 1970s economy is now being reversed. The key phrases for corporate management today in large and small organizations are: "Let's reduce our overheads. Let's streamline our operation. Let's out-source our labor force."

In order to fully comprehend the service sector's components, a comparison of its employment with employment in other industries (Figure 1) is helpful.

Figure 1. Distribution of Employment by Industry
1986

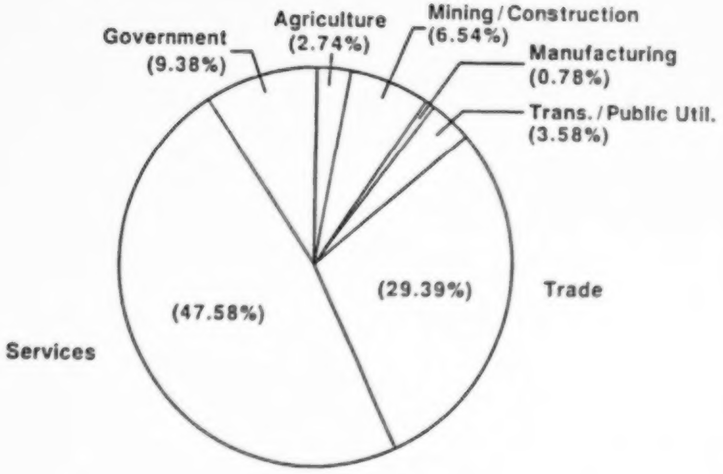


Source: U.S. Department of Labor, Bureau of Labor Statistics, 1987.

About 18 percent of the total U.S. employment in 1986 was in manufacturing; a little less than 3 percent was in agriculture. (Wisconsin's figures for these sectors differ because of the state's agricultural emphasis.) Typically, employment statistics for the service sector include: transportation and public utilities (5.14 percent); wholesale and retail trade (23.11 percent); personal and business services, finance, insurance, and real estate (28.78 percent); and government (16.23 percent). The only categories excluded from the service sector are: agriculture (2.75 percent); mining and construction (5.53 percent); and manufacturing (18.44 percent). To base service industry statistics and trends on 70 percent of all jobs is unrealistic. Certainly a more definitive classification system is necessary.

Employment Gains. From 1976 to 1986 there were tremendous gains in service industry employment. Manufacturing was virtually flat during this time period, but wholesale and retail trade increased by 29 percent. Government showed a 10 percent employment gain due mostly to state and local jobs. Figure 2 shows the employment gains for this decade.

Figure 2. Share of Total Employment Gains by Industry 1986 vs. 1976



Source: U.S. Department of Labor, Bureau of Labor Statistics, 1987.

Four Basic Categories. Another way to look at services is in a more definitive functional breakout developed by the BLS. Their breakout shows illustrative patterns, but was derived from existing categories. The BLS accounts for about 60 percent of the labor force in four basic categories:

- Distributive services: transportation, public utilities, communications, and wholesale and retail trade;
- Producer services: banking, insurance, real estate, credit agencies, and legal and business services;
- Consumer services: hotels, repair services, motion pictures, private households, and recreation; and
- Nonprofit services: health, education, and social services.

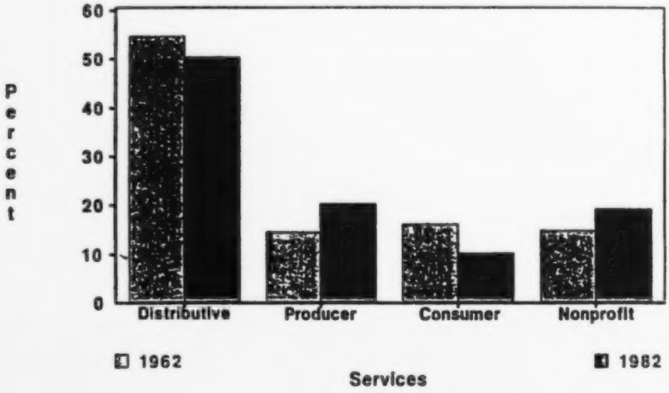
> *The service sector has generally created most of the job growth and is dominated in its skills structure by professional, technical, and managerial skills.*

In looking at the kinds of jobs in these functional areas, it becomes apparent why Kutscher (1986) said, "The major part of our employment growth in the last business cycle recovery has been in professional, technical, and managerial jobs." The service sector has generally created most of the job growth and is dominated in its skills structure by professional, technical, and managerial skills. For example, nonprofit services such as hospitals, employ many people doing relatively low-skill tasks, but the category is dominated in its employment structure by highly-skilled people with very specialized technical skills. For this reason it is important to analyze the service sector's diversity and strength in terms of the required skills.

Within the service industry's four categories there have been some shifts over the last few decades. Figure 3 shows service sector employment distribution over a 20-year period, with some indicators of potential future changes.

I have made some service industry projections for the next 15 to 20 years, but they are not dramatic in terms of new trends. This is largely because of massive relocations, which are already occurring and are really forerunners of future change.

Figure 3. Service Sector Employment Distribution
1962 vs. 1982



Source: U.S. Department of Labor, Bureau of Labor Statistics.

Distributive services accounted for a slightly smaller part of our economic activity than they did 20 years earlier. In contrast, producer services and nonprofit services have been and will continue to be the largest growth areas. Consumer services today have a smaller role in employment, partly because of the decline in household service workers that were dominant in the early post-war period.

It is interesting to look at the change in one particular service sector: distributive services. Employment in this category increased by 65 percent, partially due to large gains in the airline industry as a major source of travel; the rise of travel support services such as limousine services; and until recently, growth in television and radio broadcasting. More outmoded, less competitive sectors such as water transportation and railroads actually had declines during this period. To account for change in the service industry, individual job categories must be examined for their own particular situation since there are growing as well as declining sectors in business services.

Table 1. Service Sector Employment
1962 vs. 1982

Service category	Change in employment, percent
Distributive services	64.9
Transportation services	214.0
Radio & television broadcasting	129.5
Air transportation	125.3
Retail trade	81.4
Wholesale trade	65.0
Communications (excluding radio)	62.9
Electric, gas & sanitary services	43.5
Motor, freight & warehousing	36.8
Pipelines (excluding natural gas)	1.4
Local, suburban, and interurban passenger transportation	- 2.7
Water transportation	-14.9
Railroads & related services	-46.1

Source: U.S. Department of Labor, Bureau of Labor Statistics.

Business Service Growth. Business services are probably the most misunderstood and dynamic category in the service sector. Corporations are buying services from the outside, rather than providing them internally. Temporary help firms have sprung up across the country because corporations and individual consumers are cutting back their overhead, but yet still need these services. As a consequence, many new jobs have been created within business services during the last decade.

Service Industry Impact on Other Sectors

The service sector is a strong and pervasive force in our economic system, but many people do not realize the significant role it plays. They claim that if we do not generate manufacturing jobs that produce hard products, we are simply taking in each others laundry and living on a weak base. That is absolutely not true.

Producing hard products is not essential to realizing benefits.

A strong economy is not built by merely changing the labels on agriculture, mining, construction, manufacturing, or services. Value must be added to each of these so that people are willing to pay for services and create a market demand that benefits the economy. Producing hard products is not essential to realizing benefits.

Secondary Services. Our economic system also contains secondary services--services that are within the more traditional sectors of our economy. From an industrial organization point of view, there are two kinds of secondary services: These activities have diverse activities as shown in Table 2.

Table 2. Comparison of Contributory and Support Activities

Contributory activities	Support activities
Related to a primary SIC	Not related to primary SIC
Revenue generating	Not revenue generating
Output item	Input item
Diversification of product line	Vertical integration
Selling price stated separately	Selling price bundled with product or service price

In manufacturing, contributory activities may support the primary industrial activity; for example, the engineering team that designs welding procedures to be used by robots in assembling cars. Or, contributory activities may be quality control technician checks. Either way, contributory activities make it difficult to categorize manufacturing activities today. These activities are not really directly manufacturing, but rather they contribute to the manufacturing function and could be classified under manufacturing or services.

Support activities are more complex and harder to identify. They are not really related to the primary industrial activity. These activities could include such things as maintenance repair, transportation, and training and could be purchased from unaffiliated establishments, but firms find it more advantageous to provide these services for themselves.

For example, a manufacturing firm's print shop is an essential business component, but it is not inherent in the manufacturing activity itself. Therefore it is a support activity. Most organizations have few support activities that are separated from the major service. Any value added through these support services is hard to quantify since they are absorbed into the industry itself.

The value added to manufacturing and the importance of manufacturing today is the same as it was 30 years ago.

Surprisingly, the value added of manufacturing industries, as a share of total national output, is the same as it was in 1955. Manufacturing has been reorganized so that many secondary services are classified outside manufacturing, and manufacturing employment has decreased or stabilized in the past 10 years. In reality, however, the value added to manufacturing and the importance of manufacturing today is the same as it was 30 years ago.

These trends have made a great impact on our total economic system. Trends in workforce distribution have evolved in the post-war periods and manufacturing has become a smaller employment source. Even within the manufacturing sector, skills and jobs are increasingly service oriented and white collar oriented rather than production oriented. Government employment has remained fairly constant. The tremendous growth in employment has occurred in the service sector.

Service Sector Productivity is Hard to Measure

Labor force statistical data are based on the SIC industrial classifications. The SIC system was last revised in 1972, with a minor revision in 1977. A 1987 classification has been proposed by the U.S. Office of Management and Budget (OMB), but it is only a modest improvement.

One reason we have such a hard time understanding productivity is that we do not have good industry classifications.

Most people would admit that we are indeed a service-oriented economy. One reason we have such a hard time understanding productivity is that we do not have good industry classifications. Average employment per 4-digit SICs in business services alone shows 122,000 employed in this industry (Table 3), however, this can only be a very rough measure of the diversity of this sector. The lack of precise industry classifications often means that input measures developed by one department, e.g., labor input by the BLS, may not match up properly with output measures, e.g., sales as measured by the U.S. Census Bureau. With imprecise measures of input and output, productivity analysis becomes highly inaccurate.

Table 3. Average Employment in "4-Digit" SIC'S

Industry sector	Number of 4-digit SICS in sector	Average employment per 4-digit SIC (thousands)
Goods producing industries		
Mining	42	22.8
Manufacturing	451	47.0
Service industries		
Transportation, public utilities & communications	70	73.6
Wholesale trade	61	86.4
Retail trade	64	236.1
Finance, insurance & real estate	70	69.9
Business & consumer service	130	122.3

Source: U.S. Department of Labor, Bureau of Labor Statistics

In the broad sense, productivity is the future standard of living. Although service industries may seem productive, the quality of their product is constant; only their wages change over time. Therefore, according to standard "value added" concepts in the national accounts, service industry productivity change is zero by definition. The problem is that statisticians and economists have not yet determined how to measure the output of the service sector. Products are measured in terms of wages, so only marginal gains are shown in productivity. Newspapers often refer to the nation's sluggish productivity, reporting that productivity is only increasing about 1 percent, whereas we used to grow by 3 to 4 percent. The problem, of course, is that the measure is not very good. The only areas of productivity that are measured well are agriculture (bushels per acre and per person hour), or manufacturing (tons of steel per worker). How do we evaluate a car that is produced with higher quality? It has more safety features, etc., but quality change is not a factor in measuring productivity.

If we are going to understand the workplace over the next few decades, we must do a much better job of understanding the contribution of the service industry to national well-being and productivity.

If we assume that the service industry--which is now two-thirds and soon will be three-quarters of our economic activity--has no productivity gains, then we are misleading ourselves as a nation in our economic policy making. Clearly, our standard of living is increasing and that can only happen through higher productivity. If we are going to understand the workplace over the next few decades, we must do a much better job of understanding the contribution of the service industry to national well-being and productivity.

The tremendous challenge for all of us is to understand better the role of the service sector and to make sure that others recognize the positive trends for future employment in the nation's changing economy.

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The Economic Development Potential of Service Sector Industries in Wisconsin

This paper was edited from a presentation made by Randall E. Wade at "The Future of Working Wisconsin" conference.

The Wisconsin Department of Development (DOD) produced a major multi-volume report on manufacturing in 1982. The state was in the midst of the most recent recession, manufacturing was being hit hard, and therefore, jobs were being lost. Because of this, Wisconsin and other states have become aware of the service sector's importance in job development for a growing economy. To that end DOD (1986) surveyed the economic development potential of Wisconsin service industries.

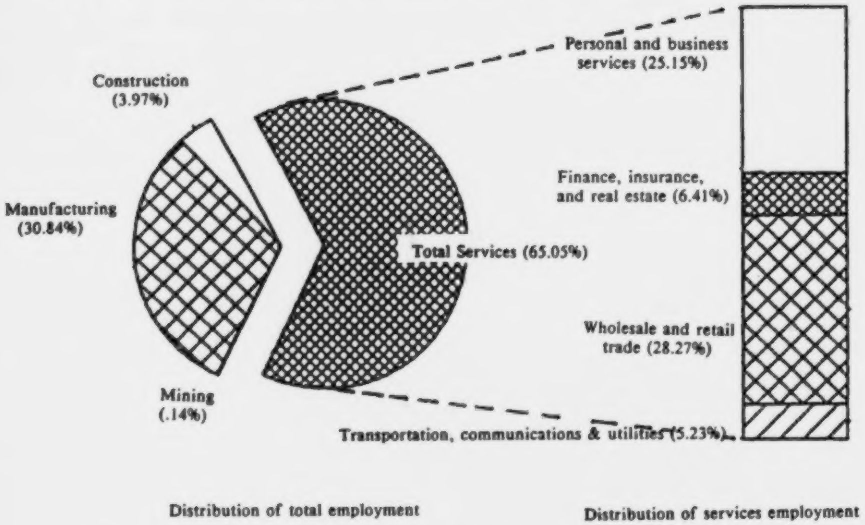
Wisconsin has grappled with the same problem Joseph Duncan (1987), national speaker for the service industries' session at "The Future of Working Wisconsin" conference, did in terms of service sector data weaknesses. The problems are multiplied at the state level, where data are not aggregated as they are on the national level. A recent Wall Street Journal article (Blustein, 1985) quoted a U.S. Department of Commerce staff person as saying, "Every blip of manufacturing is found in exquisite detail and we ignore the service industries."

Wisconsin's Service Industry Employment

The DOD (1986) attempted to alleviate data problems by developing several breakdowns of the service sector. The study used the same data base that Duncan (1987) employed, although the definition of service industries differed slightly. The total service sector in 1985 (Figure 1), with personal and business services, included 65.5 percent of the state's job employment. Manufacturing held the remaining 30.8 percent.

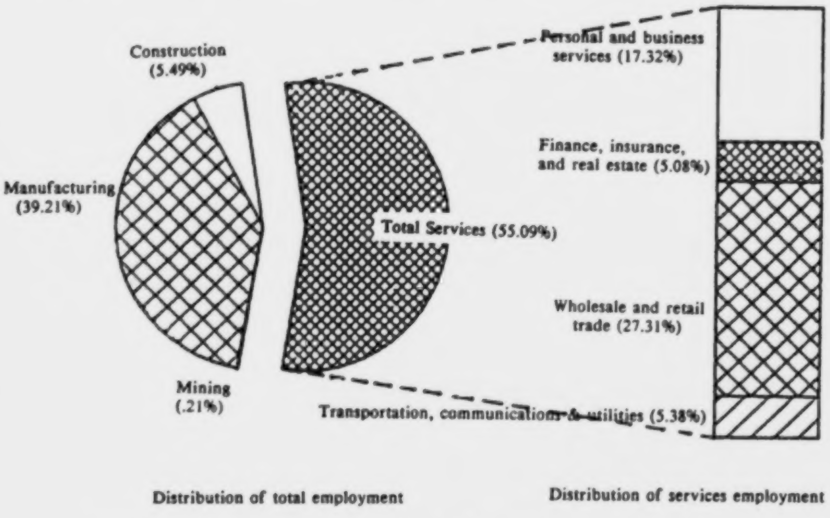
Thirteen years earlier in 1982 (Figure 2) there was a slightly different picture. Manufacturing had about 39 percent of the state's employment and the total services sector was 55 percent.

Figure 1. Distribution of Industrial Employment in Wisconsin, 1985



Source: Wisconsin Department of Development, 1986.

Figure 2. Distribution of Industrial Employment in Wisconsin, 1972



Source: Wisconsin Department of Development, 1986

The greatest difference within the service industry was in personal and business services. That sector increased by 8 percent over the 1972 to 1985 period. It should be noted that the personal and business services sector is the most diverse of all the service industries. It includes computer services, accounting, legal services, and domestic services among others.

The service industry has truly been the job generator of the Wisconsin economy.

Job Generating Potential of the Service Industry. Wisconsin is often thought of as having a manufacturing economy. But only about 4 percent or 17,000 of the total jobs generated between 1972 and 1985 were in manufacturing. The service industries, in contrast, generated 392,000 or 97 percent of all jobs during this same period and has truly been the job generator of the Wisconsin economy.

The Service Industry's High Annual Growth Rate. The service industries also have had the highest annual growth rate at 3.98 percent. The annual growth rate for manufacturing has been 0.30 percent. Construction and mining have had negative growth rates for the 1972 to 1985 period.

Service sector industries also have had incredibly high annual growth rates (Table 1).

Table 1. Growth Rates of Service Industry Sectors, 1972 to 1985

Sector	Annual growth rate, percent
Personal and business services	5.9
Finance, real estate, insurance	4.6
Trade	3.7
Transportation, communications, utilities	2.8

Source: Wisconsin Department of Industry, Labor, and Human Relations.

Service Industry's Wage Profiles. The service sector industries have a relatively low wage profile. Average wages are between $3.35 and $5.00 per hour for all sectors. In contrast, manufacturing has a more symmetric wage profile centering between $7 and $9 per hour.

The low wage profile of the service industries are disturbing; however, additional insight can be gained by looking at subsectors within the services industry. Wholesale and retail trade alone have an extremely skewed wage distribution to the low side of the scale. The trade sectors tip the entire service industry's wage profile in that direction. However, a much more well-distributed range of wage levels exists in the service industries for sectors other than the trade sectors.

Service industry wages have traditionally been lower than manufacturing for two reasons:

- The services industry has been generating most (95 percent) of the new jobs. New jobs tend to be entry level and low paying; both factors reduce the service industry's wage structure.
- Manufacturing has been going through a consolidation process. Employment has been flat or declining in most manufacturing sectors. Wisconsin and the nation still have not totally recovered from the recession. As a result, employees have high seniority and high wage levels.

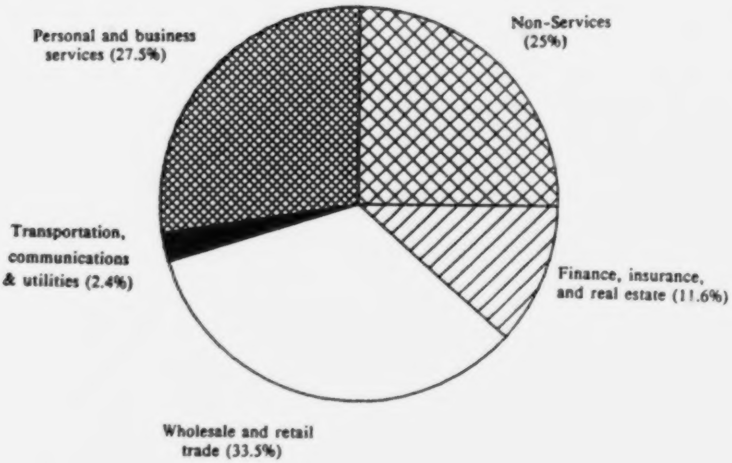
Some of the reason for shorter, service sector job tenure is because of the industry's tremendous job growth during the past 10 years.

Service Sector Job Tenure. For all industrial sectors, there is a job tenure of approximately 6.9 years. The highest job tenures are in transportation, communications, and utilities with 10 years. The lowest is in trade with 5.3 years. Construction, finance, insurance, and real estate closely follow. Some of the reason for shorter, service sector job tenure is because of the industry's tremendous job growth during the past 10 years. Many of the jobs are new and for this reason workers have not accumulated job tenure.

The Service Sector's Projected Future

An econometric forecasting model was used to project Wisconsin's new job distribution for the next 10 years (Figure 3). Not surprisingly, based upon past trends, the service sector is projected to generate 75 percent of net new jobs over the next 10 years. Non-service areas (Figure 3) such as mining, manufacturing, and agriculture will generate only 25 percent of net new jobs.

Figure 3. Distribution of Projected New Jobs in Wisconsin 1984 - 1995



Source: Wisconsin Department of Development, 1986

Since the service sector generated over 97 percent of net new jobs from 1972 to 1985, the industry's rate of growth is slowing. This is very important to recognize, although service jobs will still generate a substantial part of net new growth.

Employment Growth Will Level Off. Employment in the service sector includes only private employment and not government jobs or proprietorship. Between 1970 and 1980 there was a 5 1/2 percentage point increase in the service sector's share of total employment. From 1980 to 1985, this increased 4.5 percentage points, to yield a total 9.8 percentage point increase in the service sector's share of employment over 15 years. Using DOD's econometric forecasting model, growth in the service industry is expected to level off and increase the service sector's share of employment less than one percentage point between 1985 and 1995.

Economic Development Implications of Rapid Growth. Historically, economic development personnel focused on the manufacturing sector. They assumed that manufacturing was the basis of growth, since manufacturing was the only tradeable component of the state's economy. "Tradeable" means the ability to sell goods nationally and internationally, across state boundaries, thereby bringing wealth into the state and increasing incomes, job growth, and value added.

The service industry is becoming more tradeable and taking on some of the manufacturing industry's characteristics.

Service Industry's Tradeability. Researchers at DOD found that the service industry is becoming more tradeable and taking on some of the manufacturing industry's characteristics. Service firms are developing both national and worldwide markets. They are trading across state lines. And they are becoming significant contributors to Wisconsin's wealth and income.

A difference, however, between the service industry and manufacturing is that most employment growth will likely be in the service industry rather than in manufacturing.

Tradeability Enhances International Trade. Nationally about 40 percent of all U.S. exports come from the service industry. Only 24 percent of U.S. imports are services from other countries, so there is a positive net trade balance in the service sector. The key, internationally-traded service sectors according to the U.S. Department of Commerce (1986) are banking, leasing, advertising, education, management consulting, architectural and engineering consulting, and other general services.

How Much is Traded. A study by Ashton and Sternal (1978) looked at several New England states' trade by business service firms. A concentration of export sales in research and development was found. Sixty-five percent of the firms exported more than 50 percent of their total sales outside of that multi-state region (Ashton & Sternal, 1978). Much of this exportation was due to changes in communications and transportation technology.

Wisconsin has not really targeted its programming to the service sector in terms of future wealth and growth.

Probably the most comprehensive study (Beyers, Alvine, & Johnsen, 1985) that was done on the service sector's tradeability or exportability across state lines was in Seattle, Washington. Here there was a breakdown of the entire services sector it has generally been defined. Areas with high tradeability outside of the state were: insurance, real estate, computer programming and services, research and development (R&D), management and public relations, architectural and engineering services, and other general services. Thirty-nine percent of all sales (Beyers et al., 1985) were outside of the state of Washington. That is a fairly high number and many professionals in the economic development field have not come to grips with its implication yet. Wisconsin has not really targeted economic development programs to this important sector in terms of future wealth and growth. Other states are in the same situation so Wisconsin is not much farther behind than anyone else.

The conclusions to the study were interesting. Beyers et al. (1985) found that:

- Exports increased as the share of service sector industry sales increased. Small firms were just as likely as large firms to export across state lines.
- Most export firms were young and had been local start-ups. (This was surprising since large companies were usually thought of as having a broad market base.)

Beyers et al. (1985) felt that the findings of this study would be duplicated in virtually any metropolitan area in the country, with certain adjustments taken into account the character of each area.

Applying these findings (Beyers et al., 1985) to Wisconsin and using Seattle's 39 percent figure for sales outside of the state, it was projected that 75,000 Wisconsin jobs related to tradeable, service-sector business could be expected. That is a large, important number of jobs.

What does the future hold for Wisconsin in terms of the tradeability of service sector firms? Reynolds and West (1985) in Minnesota looked at firms that had been in business for less than 6 years. The amount of domestic, interstate, and national export sales in these firms was examined along with total exports across various industry sectors. Young firms were chosen because they will grow and eventually take the place of some of the older firms. Reynolds and West (1985) concluded the following:

- In manufacturing, 56 percent of the firms' sales were export, either outside the state or outside the country, which is not too surprising.
- Surprisingly, 19 percent of distributive services were exported across state lines.
- Of business services, fifty-two percent were exported, which was also surprising for young firms.

Service Industry's Contribution to Economic Development

Within manufacturing, value added has always been high and important. Value added for this sector includes wages, salaries, and rents. In comparing the service industry's value added to manufacturing, the distribution of dollars is used.

The value added component of manufacturing is rather small when compared to the service industry's, because the service industry is very labor intensive. Each has about the same local purchase component, but manufacturing has a much larger outside purchase component, which means leakage outside of the state economy. This is often overlooked when analyzing the service industries. We forget just how much employment they provide and how few things they buy from across state boundaries. They are usually buying labor internally and putting a great deal of value added in their sales across state lines.

We must insure that tradeable service industries do well in the state's economy.

The DOD believes that we must begin to look at the state's economy on the state level and develop techniques of targeting and identifying tradeable service industries. Some of them come to mind immediately. Insurance is a large employer in Wisconsin with much tradeability. But, there are many other services that can be identified. We must insure that they do well in the state's economy. That is our research challenge and our economic development challenge for the near and probably the long-term future.

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The Insurance Industry: A Time of Transition

Nancy M. Johnson

The past three decades have brought dramatic change to the insurance industry. Significant fluctuations in interest rates, changes in consumer patterns, and deregulations of the financial services industry contributed to this changing industry. These changes (U.S. Department of Commerce, 1983; Insurance Information Institute, 1985) included:

- Unpredictability in whole-life insurance brought about by high and volatile interest rates and a corresponding broadening of life insurance services;
- Rise of vocal consumerism;
- Rise of the "no-risk" ethic or someone else to assume responsibility if things go wrong;
- Increase in liability settlements and liability court cases;
- Public demand for corporate social responsibility;
- Greater cyclical swings in the already volatile property and casualty insurance industry;
- Greater demographic diversity including more singles, fewer families, and an aging society;
- Increasing consumer demands for higher quality services;
- Substantial changes in product mix, increases in the number of policies surrendered or allowed to lapse, surging increases in policy loans;
- Deregulation of the financial industry, with banks, thrifts, and securities institutions moving into the insurance market, and insurance companies moving into the funds and securities markets;
- Shifts of funds accumulated through purchase of whole-life policies to alternative savings institutions;
- Replacement of older life policies with newer ones that are more attractive to consumers;
- Movement of most companies to purchases of shorter term investments;

- New directions in real estate investment policy, with many life insurance companies becoming developers or owners of commercial real estate; and
- Intense product and investment diversification.

These changes have and will continue to affect both the national and state economies. In this paper the relationship of the insurance sector to the national and state economy will be discussed. In addition, the major trends and challenges confronting the insurance industry's future are reviewed.

Employment in the Insurance Industry

The insurance industry, which includes life, health, and property/casualty insurance, provides more than 2,000,000 jobs. The U.S. Department of Labor, Bureau of Labor Statistics (Table 1) recorded 1,830,200 persons employed in all branches of the insurance industry in 1985. This number has grown substantially over the years.

Table 1. Growth of Insurance Industry Employment 1960 to 1985

	Home office personnel				
Year	Life insurance	Health insurance	Other	Agents, brokers, service personnel	Total
1960	452,400	50,200	329,100	217,300	1,049,000
1965	481,200	54,200	358,000	250,300	1,143,700
1970	525,600	93,900	410,200	288,000	1,317,700
1975	520,500	122,100	442,700	339,400	1,424,700
1980	531,900	141,900	550,300	452,300	1,676,400
1985	552,600	169,300	559,700	548,600	1,830,200

Source: U.S. Department of Labor, Bureau of Labor Statistics, 1986.

When these figures are adjusted to account for independent agents and staff personnel (Table 2), the numbers revealed employment of over 2,000,000 people. The U.S. Census Bureau now shows a total of 2,079,000 persons who identify their main employment as insurance.

Regardless of the numbers used, figures indicated that the insurance industry has achieved steady growth over the past several decades while many sectors of the economy have stagnated. This growth, however, when compared to other industries within the service sector (Table 3), has not been spectacular.

Table 2. Employment in Insurance*, 1976 to 1984

Year	Property/casualty Companies	Other Companies	Agents, brokers, service personnel**	All-industry
1976	399,400	701,900	350,900	1,452,200
1977	425,300	715,600	372,200	1,513,100
1978	446,900	726,700	592,600	1,766,200
1979	467,600	732,200	625,100	1,824,900
1980	477,100	747,000	652,300	1,876,400
1981	478,000	758,900	665,600	1,902,500
1982	478,500	758,800	744,200	1,981,500
1983	470,800	762,900	744,900	1,978,600
1984	472,700	775,100	770,000	2,017,800

*Annual averages
**The 1978 to 1984 figures from the Bureau of Labor Statistics have been adjusted to account for American Council of Life Insurance estimates, of additional independent agents and staff personnel.

Source: U.S. Department of Labor, Bureau of Labor Statistics, 1985.

Table 3. Service Sector Employment

Producer services	Change from 1962 to 1982, percent
Holding & other investment companies	684.2
Business services	266.7
Legal services	255.3
Miscellaneous professional services	225.9
Credit agencies	166.2
Banking	131.6
Security & commodity brokers	107.8
Insurance agents & brokers	105.7
Real estate & rental	78.9
Insurance carriers	45.2

Source: American Council of Life Insurance, 1986.

Turnover in the Life Insurance Industry. The growth in insurance also tends to mask some of the volatility within the industry itself. There has been a considerable turnover in U.S. life insurance companies, yet overall, the trend in the number of companies, as in employment, is up from 649 in 1950 to 2,260 in 1985 (American Council of Life Insurance, 1986).

Fluctuations in Property/Casualty Insurance. This volatility is also reflected in the property/casualty insurance business. Profits and losses (Table 4) of property and casualty insurance companies, particularly in recent years, have been subject to greater fluctuations than those of other industries such as banks, utilities, and industrial companies. The property/casualty business during the last 25 years has recorded a net underwriting loss (after policyholders' dividends) of more than $65 billion. The industry has shown profits on underwriting operations in only 7 of the last 25 years (Insurance Information Institute, 1987). Investments of capital and surplus accounts, together with money set aside as loss reserves and unearned premium reserves, have generated income in those 25 years, thus permitting companies to continue insurance operations despite frequent underwriting deficits.

Table 4. Underwriting Results
Property/Casualty Insurance Business, 1961-1985

Year	Net underwriting gain/loss
1961	164,821,263
1962	46,514,135
1963	- 508,431,662
1964	- 672,106,297
1965	- 709,529,514
1966	- 19,874,782
1967	- 254,958,281
1968	- 568,749,057
1969	- 1,047,954,242
1970	- 425,781,395
1971	826,171,778
1972	1,061,651,090
1973	6,063,446
1974	- 2,644,898,126
1975	- 4,226,797,675
1976	- 2,188,651,570

1977	1,111,802,569
1978	1,296,331,868
1979	- 1,300,771,725
1980	- 3,333,967,785
1981	- 6,287,635,987
1982	-10,289,866,034
1983	-13,322,070,056
1984	-21,476,946,769
1985	-24,793,538,539

Source: A.M. Best Company, Inc., 1986.

The property/casualty insurance is a mature industry. In relation to the gross national product (GNP), property/casualty premiums have shown only a slight increase from 2.9 percent average for the 1960s to 3.5 percent in the 1970s and early 1980s. Premiums are expected to decrease their share of GNP to 2.8 percent, and thus the industry's growth rate will be lower than the overall economy's growth. In a mature industry, strategy for company growth will be more targeted. Also, insurance companies may withdraw from an unprofitable market or line.

Traditionally the property/casualty industry has had a lower rate of return than other industries. From 1960 to 1981 the rate of return was 2.5 percent below the average for all industries.

A breakdown of both the number of life insurance and property/casualty companies per state revealed a great disparity among states. The property/casualty insurance business in the U.S. comprised 3,468 individual companies in 1985. About 900 of these companies operated in all or most states and wrote the vast majority of the business. The other companies performed vital insurance services limited to people in sharply defined geographical areas or to members of specialized groups, such as farmers.

Life Insurance Differs Among States. There are 2,210 life insurance companies in the U.S. (fraternal benefit societies are not included.) Like the property/casualty companies, the number of life insurance companies shows considerable disparity among states. Of the companies in business, there are at least two domiciled in each state with the exception of Alaska, which has one. Arizona has the largest number with 616 companies, followed by Texas with 276 and Louisiana with 114. Wisconsin has 31 life insurance companies.

Types of Individuals Employed in Insurance. Because of insurance companies' growth, they are employing many more people. But beyond this, is the major transition in the types of individuals employed. In the past 15 years, insurance companies have made significant progress in the hiring of women and minorities. Information compiled by the Equal Opportunity Employment Commission revealed that:

- Members of minority groups constituted 17.7 percent of insurance personnel in 1983, up from 10.7 percent in 1970.
- Women constituted about 65 percent of the insurance industry workforce in 1983, slightly higher than in 1982 and up from 55 percent in 1970.
- Of the employees classified as insurance officials or managers in 1983, 30.4 percent were women, up from 10.8 percent in 1970.
- Women comprised 46.3 percent of all professional employees in insurance in 1983 (up from 16.9 percent in 1970) and 66 percent of insurance technicians (up from 38.4 percent in 1970).

These figures illustrate that the insurance industry is making progress toward equal opportunity employment. Many insurance companies are piloting other employee-related programs including day care, flexible hours, training programs, part-time work, and work-at-home programs. In this respect, the insurance industry continues to be an innovator and pioneer in employee relations.

Rapid Changes in the Industry: Linking Agencies

In general, financial institutions, including insurance companies, are in the midst of rapid change due to technical innovations, changes in regulations, volatile worldwide economic conditions, growth of financial conglomerates, and more demanding consumers. Insurance companies are adding such financial businesses as stock brokerage, total financial planning, and credit cards. Concurrently, retailers are offering insurance, real estate brokerage, banking, and general purpose credit cards. At the same time, brokerage houses are offering insurance; banks are acquiring discount brokerage houses; and both are moving toward becoming full-fledged players in the insurance business.

Insurance companies and banks are establishing alliances that involve banks leasing space to insurance companies or agencies whose salaried employees sell insurance to the bank's customers, with some agreement for paying the banks a commission on sales. Such arrangements exist in several states including New York, Georgia, Tennessee, Illinois, and California. Similar alliances are under consideration in other states. Whether or not consumers really want these services remains to be seen.

Cyclical Nature of Property/Casualty Insurance. A continuing trend will be the cyclical nature of the property/casualty area that will affect the insurance product's price and availability. External factors, such as changes in interest rates, regulatory activity, growth in litigation, and rising medical costs play a key role in determining price. Internal forces focus on the industry's highly competitive nature with periods of tight market conditions, characterized by rising rates and diminished availability of coverage and periods of soft market conditions, with weakened prices and insurance coverage that is readily available.

Consolidation and Diversification The insurance industry is also facing a period of consolidation and diversification. According to the National Association of Insurance Commissioners (NAIC), 21 property/casualty insurance companies were declared insolvent in 1985. The NAIC also found that 212 companies were experiencing financial difficulty. Contributing factors included too many lawsuits, excessive delays, inconsistent and unpredictable verdicts, and a "no risk" attitude of consumers.

During the balance of the decade, there will be an intensified competition among companies in providing new insurance and pension products to compete with money-market funds and other financial service providers (U.S. Department of Commerce, 1984). Achieving competitive success with more attractive products and services without increasing liabilities and impairing company strength, will require innovation and sound investments.

The blurring between insurance companies and other financial institutions may continue. Banks are already in the process of acquiring insurance companies while, at the same time, seeking to attract more of the consumer's dollar by offering an entire range of diversified financial services. Insurance companies that have traditionally been conservative, will respond to these new challenges by also diversifying into new products and services, conceivably by moving into banking and brokerage operations.

Also, in the years ahead, insurance companies will be upgrading and expanding their communications structure, both for internal purposes and to improve consumer services. Computers will be used much more extensively for field operations. By linking home offices with branch offices, sophisticated terminals and minicomputers will make it possible to create sales proposals, do word processing, and perform many other functions in the field, thus saving time and money and providing more efficient customer service.

An Overview of Wisconsin's Insurance Industry

Similar to the national employment trend for the insurance industry, Wisconsin's insurance industry employment pattern has shown generally steady and stable growth. As Table 5 illustrates, there is some annual fluctuation between insurance categories, but the overall employment trend in the past 5 years has been one of steady growth.

Table 5. Wisconsin Insurance Employees

Insurance type	Year 1981	1982	1983	1984
Life	11,670	11,127	11,592	11,293
Health	3,767	3,619	3,650	*NA
Property/casualty	13,964	13,987	14,266	13,776
Agents, brokers	9,390	9,306	9,617	10,165
Totals	38,791	38,039	39,125	NA

*NA - Not Available.

A similar pattern is evident in reviewing the annual insurance payroll for Wisconsin (Table 6). There has been a steady growth in annual insurance payroll. Traditionally, the insurance sector has provided both steady employment and relatively high salaries, when compared to many areas of the service sector.

Table 6. Wisconsin Annual Insurance Payroll

Insurance type	Year 1981	1982	1983	1984
Life	$166,791	$210,168	$248,734	$276,622
Health	56,315	61,456	63,138	*NA
Property/Casualty	231,977	244,046	262,655	283,678
Agents, Brokers	132,973	142,561	152,701	167,226
Totals, in thousands	$588,056	$658,231	$727,228	NA

*Not Available

Between 1982 and 1985 the service sector contributed almost 97 percent of the net new jobs within the state. This rate is expected to drop slightly to 75 percent for the next decade. However, by all counts, the service sector will determine the major employment for Wisconsin in the foreseeable future. (Wisconsin Department of Development, 1986).

Within the service sector, the finance, insurance, and real estate sector generated over 43,000 new jobs for the 1972 to 1985 period. This represents over 10 percent of all the jobs created in the state during this 13 year period.

A 1986 study by the Wisconsin Department of Development indicated that the finance, insurance, and real estate industry had fairly typical job characteristics. The average income in these businesses was very close to the average income from all industries. Job tenure in finance, insurance, and real estate was just below the average tenure for all jobs.

The job-growth rate in finance, insurance, and real estate is expected to be about 2.1 percent or well above the overall job-growth rate of 1.2 percent, projected for the state through 1995. Banking is expected to grow a bit slower than the overall economy, but other financial institutions, insurance, and real estate are predicated to grow more quickly. Compared to other sectors of the service economy, finance, insurance, and real estate, are projected to have the state's most rapid growth (Table 7).

Table 7. Past and Projected Employment Performance of Major Wisconsin Sectors

Employment	1984 Wis. employment	Compounded annual growth rates 1979-84 Actual	1984-95 Forecast
Agriculture, forestry, fishing	15,322	5.19	-0.14
Mining	1,870	-6.66	-2.85
Construction	63,088	-4.78	1.21
Manufacturing	518,632	-2.58	0.79
Transportation, communication, utilities	85,074	0.91	0.56
Trade	453,723	0.91	1.38
Finance, insurance & real estate	99,417	1.95	2.10
Personal and business services	368,999	2.64	1.39
Government	285,289	0.14	1.29
Total	1,891,424	-0.16	1.20

Sources: Wisconsin Department of Industry, Labor and Human Relations, 1985; Regional Economic Modeling Inc., Model for Wisconsin, Wisconsin Department of Development, 1985.

Wisconsin continues to maintain a relatively large share of the national insurance industry. The insurance industry in Wisconsin is projected to exhibit employment growth of 2.26 percent (Table 8).

Table 8. Employment Forecasts for Finance, Insurance, and Real Estate

Industry	1984 Wisconsin employment	Compounded annual growth rates	
		1979-84 Actual	1984-95 Forecast
Banking	27,376	1.00	1.12
Insurance	39,376	1.81	2.26
Credit & financial brokers	19,434	5.23	2.99
Real estate	13,006	0.31	2.11
Finance, insurance, real estate	99,417	1.95	2.10
All industries	1,891,424	-0.16	1.20

Sources: Wisconsin Department of Industry, Labor and Human Relations, 1985; Wisconsin Department of Development, 1985.

Insurance and Economic Development

In many respects, the insurance industry does not fit the perceived image of the service sector. The service sector is generally characterized by low pay and high employee turnover. The insurance industry is more typical of the employment picture in the economy as a whole, with average wage and turnover rates. Insurance is also somewhat atypical because it has a service market that extends beyond the state's boundaries and in some cases, the nation. Sales made outside of Wisconsin generate dollars that employ people in the state and spur economic growth. In this respect, insurance companies have product market characteristics that are very similar to those in the manufacturing sector. For Wisconsin, the difference between the insurance and manufacturing sectors is that insurance is forecast to have substantial job growth in the next 10 years, while the manufacturing sector does not have this forecasted growth. (Wisconsin Department of Development, 1986).

The insurance industry is responsible for assets that, at the end of 1985, totaled more than $1.13 trillion. But its greatest significance in the American economy may be an absorber of personal and business risks. The property and casualty segment of the insurance business is responsible for assets that, at the close of 1985, totaled $311.3 billion (Insurance Information Institute, 1987). It provides hundreds of forms of financial protection against virtually every known peril.

The property and casualty insurance business plays a significant role in keeping the American economy moving. Insurance coverages backstop the nation's extensive commercial and consumer credit system. Further, surety bonds are required for almost all public works and commercial construction, to protect against loss in the event that a contractor fails to fulfill his or her obligations.

In large part, because of insurance coverage, American business owners, employees, home owners, and car owners have more financial protection and a greater sense of security than ever before.

Challenges for the Future

During the remainder of the 1980s and 1990s, the insurance industry will continue to be in transition. Changes will continue, influenced by demographic trends and societal values. However, just as influential will be the federal and state regulatory climate, for instance:

- Regulation will influence the extent to which financial service companies compete with one another for the growing financial services market.
- Regulation will determine the number of insurance companies and the variety of insurance services that are available.
- Regulation will determine the internal flexibility of insurance companies to respond to niche markets.

Of particular interest to insurance companies will be the direction of federal regulation under the leadership of Wisconsin's U.S. Senator William Proxmire. Will Proxmire continue the current deregulation trend or will he move toward a more regulated environment?

Currently, insurance is regulated by the states, and current trends favor local as opposed to federal control. The public also favors state control. A 1980 Harris survey indicated that 61 percent of the public supported state control of insurance regulation. However, a federal change in bank or broker insurance regulation could change the balance between federal and state regulation. In addition, development of national health insurance to deal with the growing need for long-term care, could bring about federal regulation in the future.

Another major challenge is the organized consumer movement, which has entered a mature phase. Today, it is no longer a special-interest group, but a widely accepted force in society. Consumer awareness and education have never been higher. Public concern over a return to the "buyer beware" marketplace is growing. A 1982 Harris public opinion poll comparing consumer attitudes in 1982 with attitudes in 1976 showed more people in 1982 were worried about the poor quality of products, companies' failure to handle complaints properly, and inadequate warranties (Figure 1).

Similar studies conducted for American Family Insurance Company (Goniu & Johnson, 1986; Tedeschi & Johnson, 1986) of customer satisfaction revealed that prompt service, claim representative reliability and professionalism, and personal attention were of great importance. These same studies (Goniu & Johnson, 1986; Tedeschi & Johnson, 1986) also found that there exists significantly higher expectations for future services.

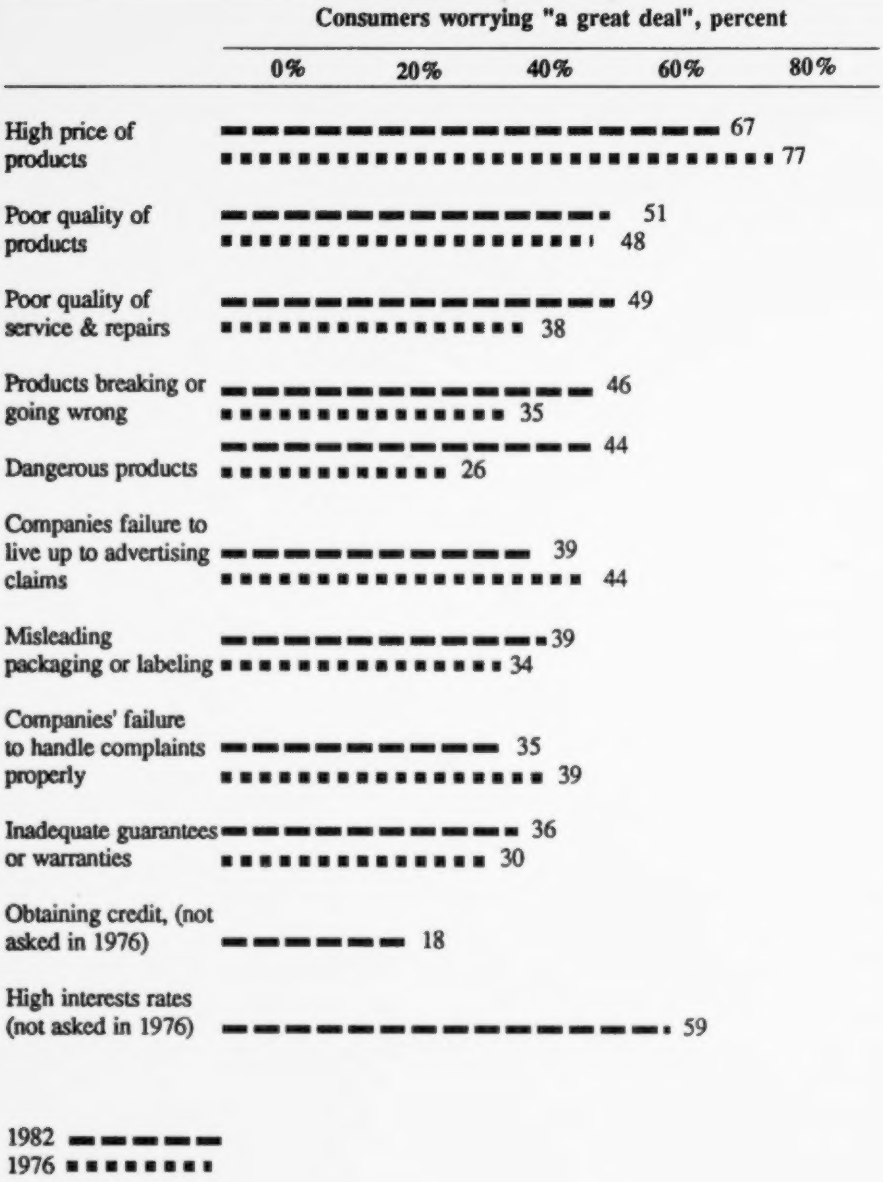
American Family Insurance Company's findings coincide with results from a recent study conducted by Yankelovich, Skelly, and White, Inc. (1984) commissioned by The Travellers Insurance Companies. Their findings (Yankelovich, Skelly, & White, Inc., 1984) reflected a fundamental change in consumer attitudes: Consumers now identify fair treatment as the key differentiating characteristic of insurance companies. Consumers are more concerned about fairness, which was interpreted to mean:

- Good value for the money. Consumers want low prices, but not at the expense of quality in the product or service support.
- Reliable, professional help in a technical field where customers feel they cannot or do not want to understand the complexities and want to deal with someone competent and trustworthy. (They expect high caliber, reliable people throughout the organization.)
- Equal treatment tempered by pragmatism: Everyone, big or small, should be treated the same.
- Responsiveness to individual needs, including prompt help and continued assistance, especially when problems arise.

For insurance companies, anticipating customers' needs and expectations will be absolutely imperative in the future.

For insurance companies, anticipating customers' needs and expectations will be absolutely imperative in the future. Insurance companies will need to project themselves into a buyer-seller relationship that is more than a simple trust contract between them and

Figure 1. Consumer Wories, 1982 versus 1976



the policyholder. A promise of continuing contact between two economic entities for mutual benefit will be necessary.

It is likely that the distinction between the public and private sectors will become less well defined. Specifically, market segments for individual products will be absorbed through government or employee group financial security programs (American Council of Life Insurance, 1986). On the other hand, the shortage of funds the country is likely to face may spur some of the anticipated movement toward government provision of financial security. In either case, the end result can be greater pressure on the private sector to operate in accordance with both social and economic goals. For insurance companies, this will be the case for both federal and state governments. From a positive perspective, greater cooperation between insurance and government may be in the best interest of business as well as the public.

There will also be increasing pressure placed on insurance companies to expand their corporate social responsibility, because of the need to respond to the evolving social ethic and business/social relationship. Insurance companies are already moving in this direction. The possibility within the next few years that investment capability will be increasingly restricted, with portions of investment capital mandatorily diverted for national needs is even more of a concern.

A potential trend for the industry is toward splintering of the market.

The future structure of the insurance industry, however, is difficult to forecast given the range of uncertainties in the regulatory, technical, and economic areas. A potential trend for the industry is toward splintering of the market, both horizontally in terms of geographic and product specialization and vertically in terms of services performed. This trend receives its impetus from demographic, social, and economic factors affecting the industry. A counter-trend would be toward a consolidation market that could lead to a reduction in the number of insurance companies. This trend receives it impetus from deregulation, competition, and economic factors affecting the insurance industry. (Insurance Information Institute, 1985).

For the insurance industry, the foreseeable future will be a time of change and challenge. It will be a time of steady, though not spectacular growth. In this aspect, the industry will be one of a number of service industries contributing to Wisconsin's economic growth. It will also be a leader in demonstrating corporate social responsibility and will pioneer new approaches to customer service. Insurance companies will also form new partnerships with all governmental levels to serve the public good.

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The Importance of Foodservice to the Future of Working Wisconsin

Edward J. Lump

The foodservice industry in Wisconsin is the major growth segment of the service industry. This is true largely because foodservice has become an integral part of American life. However, foodservice is a dynamic industry that is wrought with pitfalls for individuals who do not recognize trends, adapt to changes in consumer habits, or have the skills necessary to compete in this fast-paced marketplace. All of the information presented in this text was taken from the National Restaurant Association's (1986) newsletter.

Rapid Growth in the Foodservice Sector

Most national trends in the growth of foodservice are also reflected in Wisconsin growth trends. Total eating and drinking sales in Wisconsin exceed $3 billion annually, with more than 40 percent of the consumers' food dollar spent in dining-away-from-home experiences. Growth in this industry is highlighted by several facts:

- Foodservice is the number one retail employer in the nation and in Wisconsin and accounted for over one half of all employment growth in the retail trade sector between 1975 and 1985.
- Total employment in Wisconsin in just eating and/or drinking establishments is 118,000 people. This does not include those employed in foodservice in lodging places, airlines, hospitals, or universities.
- There has been an 11 percent growth in this industry since 1979. In comparison, during this same period, manufacturing employment declined 13 percent.
- Nearly two thirds of all those in foodservice occupations are women, and one fourth are teenagers.

This growth has opened up foodservice for major managerial and entrepreneurial opportunities. Foodservice employs more minority managers than any other retail industry. More than half of all foodservice managerial and administrative personnel are women, and the number of managerial personnel employed at eating and drinking places will increase by nearly 25 percent over the next 10 years. This growth will continue, although at a slower pace than it has in the past decade, mostly due to the saturation of some markets.

The reason for this outstanding and continuing growth is due to the foodservice industries' integral part in American life.

Reasons for Growth. The reason for this outstanding and continuing growth is due to the foodservice industries' integral part in American life. "Integral" means that it has become essential. Just 25 years ago, the restaurant industry catered almost exclusively to luxury or recreational dining experiences. Now, with the advent of dual-income households, consumers increasingly do not have the time to shop for and prepare food. They are becoming more dependent on foodservice for meals. As a result, breakfast now accounts for 10 percent of dining-out occasions. This necessity dining also is reflected in the fact that 4 out of every 10 dining occasions in 1985 were for take-out or delivery. A recent Gallup survey, for example, indicated that at least 60 percent of meals consumed away from home are considered "necessary."

Consumers now spend more than 40 percent of their food dollars away from home and dine out an average of 3.7 times per week.

"Baby Boomers" Eat Out. Consumers now spend more than 40 percent of their food dollars away from home and dine out an average of 3.7 times per week. Other factors contributing to the essentiality or necessity of dining away from home are demographic trends such as the rising number of senior citizens, singles, working women, smaller households, and the maturing "baby boom" generation. For example:

- The number of Americans aged 65 and over will total 35 million by the year 2000, a 37 percent increase in just 20 years. Senior citizens will account for 13 percent of the population in the year 2000, versus 11 percent in 1980. With higher discretionary income levels and more leisure time, this group will be a prime market for food service.
- The number of single households is expected to increase by 30 percent between 1980 and 1990. By 1990, singles will account for more than one quarter of all households. Singles spend more than half of their food budget on dining out and eat out more often than any other type of household. They are the most likely to visit fast-food and family restaurants for convenience reasons.
- The number of working women will almost double between 1970 and 1995. By 1995, almost 47 percent of the workforce will be women. Six out of 10 females will be working by 1995. Working women dine out more often than nonworking women for convenience reasons.

- The maturing "baby boom" generation, slightly more than 70 million, includes one out of three Americans. Members of this group, who are moving into their prime income-producing years, spend a significant portion of their income on dining out.

Foodservice: A Changing and Dynamic Industry

Foodservice is a very competitive and changing industry that requires special management skills in addition to the traditional food preparation skills.

Foodservice is a very competitive and changing industry that requires special management skills in addition to the traditional food preparation skills. Managers in today's foodservice industry must be able to recognize trends and react rapidly to changes in consumer habits and the marketplace. Just a few years ago, Wisconsin's foodservice industry was largely made up of steak houses on the top side, and "ma-and-pa" cafes on the bottom side. Today, although there are still traditional full-service supper clubs and "ma-and-pa" cafes, many popular segments of the industry between these two levels have been established. These include fast-food, where the industry's largest growth has taken place; family restaurants; pizza establishments; and gourmet and ethnic restaurants. Carryout and delivery services are also becoming more popular.

This diversity in type and style of restaurants is reflected in the composition of the industry itself. While chains with 25 or more units accounted for 27 percent of all eating-place sales in 1982, most restaurants are still single-unit operations, and about half are sole proprietorships or partnerships. Seven out of 10 restaurants have annual sales under $500,000, with average sales per establishment for a full-service restaurant of approximately $400,000 annually, and the average sales per establishment of the fast-food restaurant about $350,000 annually.

In determining restaurant trends, the interest that consumers have developed in response to health and nutrition concerns must be considered. There is a decided trend toward quality in food consumed both at home and away from home.

Training and Educational Needs of Foodservice Employees

The foodservice industry offers growth and opportunity. Because eating out is an integral part of our lifestyle, and the industry is diverse and constantly changing, special education and training are needed. These special needs must be met in order for individual entrepreneurs, who make up the largest segment of the industry, to prosper. Many of these entrepreneurs do not come into the industry with a significant background in either foodservice or management and, therefore, need basic and continuing education provided by vocational, technical, and adult education institutions as well as trade associations.

In the past, foodservice was often thought of as a low-pay industry. However, the following facts reveal that it offers personal growth and advancement:

- The foodservice industry provides entry-level jobs, where people learn to work and develop good job habits.
- Foodservice jobs are a ladder to careers that are high-paying. In fact, 31 percent of foodservice jobs are career jobs.
- Many career jobs in foodservice become entrepreneurial and thereby create even more jobs.

Every person with a successful foodservice career must have a good overall knowledge of all aspects of the industry.

Every person with a successful foodservice career must have a good overall knowledge of all aspects of the industry. Cooks must often manage, and managers must be able to cook. Therefore, the first step in acquiring skills necessary for the industry is to develop the proper attitude toward the industry itself and the types of jobs offered. Top level employees must often play the role of plumbers, carpenters, personnel managers, psychologists, cooks, maintenance engineers, sanitarians, mathematicians, dieticians, waitpersons, buspersons, or hosts. The unwillingness of career people to accept the challenge of flexibility and adjust accordingly is one of the greatest disappointments that restaurant owners face in dealing with foodservice graduates from educational programs. An attitude that says, "I will do what I can, and learn what I cannot do," is essential to approaching foodservice careers. The following sections outline some of the basic skills foodservice employees need.

Personnel Management and Motivational Skills. The most successful restaurants are operations where teamwork is the watchword. Yet, the employees in any foodservice operation are diverse in age, mental capacity, and skill. For this reason it is important that managers have the skills to work with and motivate all employees.

Financial Management, Computer Sciences, and Mathematics. Profit margins are so narrow that frequent profit-and-loss statements are necessary, sometimes even daily. The advent of computer technology has made this record keeping possible. There are many applications in using computers for inventory control, payroll, or sales tracking. Twenty years ago, food and labor costs were related to profit and loss. Today, energy costs, interest, insurance, and all other areas are considered accountable to profit. Both cooks and managers must have a basic understanding of these areas in order to coordinate decisions that yield the most profit.

Energy Management. Energy usage has become a major factor in restaurant operation. It is important that future career people understand the techniques of energy conservation. Because the industry is a high energy user, it is possible that when shortages occur, foodservice will be called upon to cut usage significantly. This will require adjustments, innovation, and understanding.

Advertising. Restaurants are major advertisers. They need people who understand the principles behind advertising so that dollars are not wasted, and awareness is achieved. Descriptive selling must be emphasized on the menu, because the menu may be the only piece of advertising that every customer will actually read.

Communications. Accurate communication is probably the single most important skill that needs to be developed. It requires an understanding of the English language, both written and spoken. The constant communication between employees and customers must be clear so that misunderstandings do not occur.

Art. Foodservice is an art. People eat with their eyes, and the key to successfully selling more food is merchandising. Restaurant concepts must blend. Signs, decor, uniforms, table-setting, and displays of food on plates must all be unified and attractive in the customer's eyes.

Cooking Skills. Managers must develop a working knowledge of the kitchen. They do not need to be expert cooks, but they need to understand the equipment and basic cooking techniques, because they will be called upon often to cook. Many restaurants have problems, because managers do not understand the production challenges faced by kitchen workers. Conversely, cooks do not understand the necessity of a unified restaurant concept.

Sanitation. Both managers and cooks must have a high level of knowledge about sanitation and its chemistry. Foodservice employees must see the relationship between the restaurant's overall cleanliness and customers' tastes. If the customer develops a feeling that the restaurant is not clean, whether that feeling is caused by the parking lot, rest rooms, windows, odors, carpet, employees' attire, table settings, or thumbprints on dishes, the taste of the food is ruined. Even the best-prepared food will lose its appeal if the customer thinks the restaurant is not clean.

Because of the industry's competitive nature, its forecasted growth, and the diversity of individual taste, nothing in the restaurant operation can be left to chance or overlooked.

Because of the industry's competitive nature, its forecasted growth, and the diversity of individual taste, nothing in the restaurant operation can be left to chance or overlooked. Restaurants that are successful, employ trained workers with the skills discussed here. The opportunities exist in foodservice to make outstanding careers, and to make fortunes, for those who are willing to put in the work and effort to develop the skills necessary to serve this exciting and growing industry.

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SUMMARY OF PRESENTATIONS ON THE SERVICE INDUSTRIES

Speakers: **Joseph W. Duncan, Randall E. Wade, Nancy M. Johnson, and Edward J. Lump**

There are many different definitions of the service sector. The service sector defined in functional terms is more revealing than other definitions. These functional categories include: distributive services (transportation; public utilities; communication; and trade), producer services (banking; finance, insurance, and real estate; legal and business services), consumer services (hotels; repair services; motion pictures; private households; and recreation), and nonprofit services (health; education; and social services).

Employment growth in these functional categories was examined over the 1962 to 1982 period. Historic employment growth is an indicator of the changes expected in the future because the reallocation in employment has already occurred. Total employment in distributive services increased by almost 65 percent over that period, although its employment share declined. Employment in consumer services declined due primarily to employment declines in household workers. Nonprofit and producer service categories have been and are expected to be areas of substantial employment growth. Growth in business services has been the most dynamic subsector as large corporations began to contract out for services previously performed internally. Of the business services, employment in personnel supply services (temporary help) has grown most substantially, tripling since 1974 to potentially more than 900,000 in 1989. The fastest growing segment of temporary help is for medical and related personnel. The major portion of employment growth in the service sector has been in professional, technical, and managerial jobs. These higher-level skills as well as basic skills, creativity, and the quest for zero defects will continue to characterize the service sector's skill needs.

Employment growth in Wisconsin's service sector mirrors that in the nation using the traditional definition of the service sector. Between 1972 and 1985, the service sector grew at a compound annual growth rate of 3.9 percent, compared to 0.3 percent in manufacturing, and negative growth in construction and mining. On average, the service sector pays somewhat less than the goods sector. This wage differential results from the recent growth in new jobs in the service sector and the consequent greater share of entry level jobs that pay relatively lower wages. In addition, manufacturing is undergoing a consolidation process that leaves high seniority, high wage jobs intact. Unlike the goods sector, the service sector has a positive net trade balance. More than 40 percent of all U.S. exports come from the service sector while 24 percent of imports are services.

The food service industry is one of the many growth industries in the service sector. Increasingly, special managerial skills as well as food preparation skills are required. Although food service occupations are characterized by low pay, they also provide a tremendous number of entry level jobs where people learn to work and can begin a career ladder to higher paying jobs.

CRITICAL ASSUMPTIONS AND ISSUES RELEVANT TO THE SERVICE INDUSTRIES

Assumption

The service industry will continue to grow representing an expanding job market.

Issues

How can the VTAE system create linkages with service employers to provide equipment, facilities, and expertise to enhance access to rapidly expanding technologies?

What role should the VTAE system have in enabling service providers to improve the efficiency and quality of their product?

Assumption

The service sector is changing to include a wider range of job titles.

Issues

What role should the VTAE system have in improving information and procedures that enable K-12 and early postsecondary students to make informed career decisions?

What role should the VTAE system have in the formation and continuance of entrepreneurial-type ventures?

How can cooperation between business and education define educational programs that will be able to respond to service sector employment trends?

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THE FUTURE OF WORKING
WISCONSIN

Communication Technology

Rapid changes in telecommunications technology and applications have transformed, not only the way we work and play, but the way we learn. Telecommunications more than influences--it determines much of our daily activities. The ability to electronically reach people in remote areas with needed information has changed the way service providers view their role and responsibility to society. Suddenly, every person with a need to learn is a potential student, with television as the vehicle.

Louis A. Bransford
Public Service Satellite Consortium

Innovations in Education: Thirty Years After Sputnik Implementation and Inertia

Louis A. Bransford

It seems like only yesterday we received the shocking and unpleasant news of the Sputnik launch. This year, 1987, marks the 30th anniversary of space exploration. Few people foresaw Sputnik's impact, when it was launched in 1957 by the Soviet Union, several months before the U.S. ventured into space with a satellite of its own. This country was embarrassed by not being first in space and subsequently committed major resources toward establishing a firm hold on satellite technology.

Until recently, no country could match the achievements realized by the National Aeronautics and Space Administration (NASA) in concert with the space industry. The U.S. continues to maintain a prominent role in space technology, but has lost some of its preeminence in space-related research and development. The Japanese and the European Space Agency are gaining ground in satellite design. The Soviet Union's space exploration efforts, although no match for the moon landing, are a massive undertaking, much more dramatic than current initiatives. The satellite industry's free enterprise spirit can even be felt in China, where the problems with the Shuttle and the unavailability of expendable satellite launch vehicles have prompted the Chinese government to offer launch services to the U.S. One U.S. firm has recently signed a preliminary agreement with the Chinese for these launch services.

Thirty years ago we beamed with pride as we launched an inanimate object the size of a grapefruit into orbit.

These advances in space technology are remarkable. Thirty years ago we beamed with pride as we launched an inanimate object the size of a grapefruit into orbit. Today we think nothing of launching satellites 39 feet tall with solar panels extending 50 feet across. Satellite capacity has increased even more dramatically. To illustrate, INTELSAT I, launched in 1965, received and transmitted 240 voice circuits on one television channel. INTELSAT VI, to be launched in 1988, has the capacity for 120,000 simultaneous two-way telephone circuits plus three television channels.

Fiber Optic Technology

The latest breakthrough in telecommunications technology is fiber optics. A single, finger-thick strand of optical cable could carry every telephone conversation held on an average business day in the U.S. Telephone fiber optic lines are being put in by the tens of thousands of miles.

An interactive video telesystem now in operation links seven high schools in rural Minnesota. This system broke the ground for communications in education at many levels from elementary schools to colleges. The network represents the first school telesystem in the U.S. to use fiber optic technology. It demonstrates the recent arrival of fiber optics as a cost-competitive alternative to microwave, coaxial cable, Instructional Television Fixed Service (ITFS), and low power television.

Future technological possibilities are mind-boggling when satellites and fiber optics are mixed with existing terrestrial systems. A 10 cent-a-minute long distance telephone call is envisioned by the early 1990s. Long distance phone charges will no longer inhibit access to services such as electronic bulletin boards. There will be instant, inexpensive access to thousands of bulletin boards from coast to coast. Long distance "telecommuting" through home computers will be possible for all, without the anxiety of astronomical monthly phone bills.

Telecommunications has Transformed Work and Play

Rapid changes in telecommunications technology and applications have transformed not only the way we work and play, but the way we learn.

Recent technological advances have opened new doors for many organizations, both public and private. Rapid changes in telecommunications technology and applications have transformed not only the way we work and play, but the way we learn. Telecommunications more than influences--it determines much of our daily activities. The ability to electronically reach people in remote areas with needed information has changed the way service providers view their role and responsibility to society. Suddenly, every person with a need to learn is a potential student, with television as the vehicle.

The power of television is awe-inspiring. On the average, television is viewed more than 52 hours per week--more time than most people spend on their job. More than 90 percent of all households with television have color sets, and 1.5 million consumers have television receive-only antennas (TVROs) in homes, restaurants, and hotels. Fifty percent of TVRO buyers are cable subscribers. Over 30 percent of all households now have videocassette players and use them so routinely that over-the-air broadcasters, cable television systems, and movie theaters see their market being eroded, while programmers hurry to record fresh material in Beta and VHS formats to meet the ravenous consumer demand. Videocassette recorder penetration is expected to reach 75 percent by 1990.

Education and Interactive Technology. Much of the technology has been harnessed for corporate purposes, either as a new tool for trade or as a means to sell and deliver a product, with entertainment heading the list. But little concerted effort has been made to explore ways in which new technologies could be made to work in the continuously interactive process called education. Hardware designers produce computer chips for video arcade machines that allow a child to control the actions of vivid cartoon animations, but they do not install the same chip or program into a classroom terminal on which a child or an adult could learn the mathematical algorithms that make the animation possible.

Popular movies or exercise tapes are easily accessible from video stores that have erupted in most shopping malls, convenience stores, and supermarkets. Commercially distributed educational programs are limited. There are exceptions. The Learning Channel, an educational programming service distributed via cable, provides more than 20 hours per day of quality educational programming to over eight million households, businesses, and educational institutions across the U.S. TI-IN is a private educational satellite network transmitting live interactive programming to more than 200 schools and education centers throughout the country.

On a semipositive side, the most watched and most timely Public Broadcasting Service (PBS)-distributed programs will be available on a rental basis within the year. National Geographic specials, such as "Nova," or "Live from the Lincoln Center," will be offered as an alternative to popular movies. If consumer demand warrants, video stores will stock the tapes. If not, they won't. It's that simple.

At the very time that technology can reward spontaneity and enthusiasm with instantaneous access to an informational cornucopia, the equipment and materials available to students are archaic, traditional, and sterile.

The educational system is inherently wasteful. At the very time that technology can reward spontaneity and enthusiasm with instantaneous access to an informational cornucopia, the equipment and materials available to students are archaic, traditional, and sterile. Students ought to have available videotape programs that would make the topics they are studying more real and meaningful. A teacher whose students are exploring other continents should be able to schedule

National Geographic specials on Australia or Papus, New Guinea. When a Nobel Laureate lectures at Massachusetts Institute of Technology (MIT) about the latest advances in recombinant DNA, a biology major on the West Coast should be able to attend the lecture electronically by accessing MIT's closed circuit system.

Teleconferencing in Education. Teleconferencing is, perhaps, the latest phenomenon that many educational institutions are now exploring. The presence of satellite earth stations at many colleges and the creation of satellite networks have been the driving forces behind teleconferencing in education. Teleconferencing is a generic reference to electronic alternatives for bringing people together. By linking two or more geographically separated sites, teleconferencing is proving to be a more cost-effective and time-effective method of offering continuing education, conducting business meetings, and presenting seminars and workshops--all in real time, all in an interactive mode, and all without travel.

Various types of teleconferencing formats exist, allowing groups to link computers, telephones, television monitors, and even studios. With many visual teleconferences, satellites are used as the transmission mode to achieve even greater cost-efficiency. Full-motion, one-way video, and two-way audio is the teleconferencing mode most commonly employed. While some groups would prefer a full-motion satellite video-teleconference for their events, budgets have often restricted teleconferencing to audio or audiographic only. In addition, a large number of organizations have program needs that do not warrant full-motion video even when funds are available.

The ambitious projections, that demand for satellite teleconferencing services would far exceed the availability and supply of satellite transponders, have not been realized.

The ambitious projections; that demand for satellite teleconferencing services would far exceed the availability and supply of satellite transponders, have not been realized. The explosion, particularly in video teleconferencing, has not occurred. Growth has taken place, but on a much more modest scale. An aviation report predicted in the early 1980s that by 1985 teleconferencing would significantly divert airline business travel revenue and mail service. This has not happened. In fact, financial reports indicate that both travel and mail services have increased, not only in terms of revenue but in utilization. In 1985, the nation's airline industry posted its first industry-wide profit of $1 billion since the 1978 airline deregulation.

Teleconferencing in Business. There were estimates by teleconferencing promoters in the early 1980s that as much as 30 percent or more of today's conventional meetings would be replaced by teleconferencing by the end of the 1980s, climbing to 50 percent by the year 2000. These projections were, in retrospect, both overestimated and misleading. Certain types of repetitive meetings have been replaced, but in general there is no empirical evidence that conventional meetings have been replaced by teleconferencing. Those organizations that have acquired dedicated facilities are exceptions, and the total number of public or social service organizations that have dedicated facilities are very few, although they have expanded dramatically in the last year.

Dedicated networks are designed and built by a user or a user's contractor, or are leased by the user. For some applications they can be surprisingly affordable. Dedicated satellite networks operating in 1986 were established by J.C. Penney, American Bar Association, Eastman Kodak, Ford, the National Education Association, MicroAge, Hewlett-Packard, Texas Instruments, HI-NET, and others. Dedicated networks are typically built as a system, with uplinks (satellite transmitting stations at principal origination cities) and downlinks (satellite receiving stations at branch offices located throughout the country) engineered for maximum compatibility and reliability. The real growth manifested in the overall teleconferencing industry, however, has been interpreted in less positive terms, because market projections have not met with initial expectations.

There is general agreement that teleconferencing is a viable alternative to traditional means of delivering programs and services, but the arguments justifying its use are based less on cost than on revenue-generating potential. Today there is less emphasis on the technology and much more attention to applications.

Value-added benefits do continue to make a difference. Teleconferencing allows an organization to:

- Better utilize staff;
- Involve key people who ordinarily would not travel;
- Promote more systematic planning; and
- Facilitate replication of program materials.

Saving money, saving time, reaching more people, or making money are video-teleconferencing's primary motivators. Educational planners must consider the requirements of a particular communications project and weigh the advantages of video-teleconferencing against the budget, calendar, and income objectives.

Increased Use of Video Networks. One rationale for increased use of video networks is the increase and improvement in communications. Companies that now routinely use video are finding that not only are travel costs diminished to some degree, but overall communication between managers and subordinates has improved as people become comfortable with the technology. Although the growth rate of video-teleconferencing in business and industry has been slower than predicted 10 years ago, a recent interview with Elizabeth Young (Brannon, 1986) noted that the current growth rate is about 40 percent per year. In 1980, there were about 50 two-way television conferences conducted in business and industry; 110 in 1981; 405 in 1984; well over 500 in 1985; and there is "every indication that number may actually double again in 1986," said Young (Brannon, 1986).

Young noted (Brannon, 1986) that the Direct Broadcast Satellite (DBS), a concept whose time has repeatedly been pushed back, certainly figures into the picture in the next few years. Although several companies have had second thoughts about offering a full-fledged DBS system, the satellites are being built, and there will probably be an operational DBS service before the end of this decade. Direct Broadcast Satellite earth stations will be less than 1 meter in size and will cost in the hundreds of dollars rather than the thousands. I envision schools, libraries, and government offices all having dedicated DBS terminals in the future.

Growth of Teleconferencing. I have observed that teleconferencing planners have adopted much more realistic goals in the past year. The advent of dedicated networks along with expanded telecommunications capability will surely accelerate the utilization and adoption of teleconferencing, but the growth will be tempered by a more pragmatic view of teleconferencing. The user community, both corporate and nonprofit, has a better understanding of the contributions of teleconferencing. Certain factors underlie much of the current thinking regarding the value, utilization, and ultimate adoption of teleconferencing, such as:

- The realization that certain information is not amenable to electronic delivery;
- The fact that travel in general is perceived as a benefit that most business people do not want to relinquish; and
- A greater awareness of the real costs and revenue potential in teleconferencing.

Adoption of technology only comes about with effective utilization.

Adoption of innovative technology is a relatively complex process. People do not just buy a computer or earth station and immediately begin to use it effectively. Satellite teleconferencing is a good illustration. In less than a decade, it has moved from a phase of awareness to one of understanding. Understanding leads to different degrees of acceptance or rejection. Utilization is one measure of acceptance, but does not guarantee effective or efficient use of innovation. Adoption of technology only comes about with effective utilization.

If this adoption formula is applied to teleconferencing, it would suggest that teleconferencing is generally well-accepted. It is being used, but has not been integrated systematically or effectively. It is moving in that direction, however, capitalizing on the knowledge and experience gained from the computer industry. *Ad hoc* teleconferencing, much of it experimental, has set the stage--the next decade will be the true benchmark for teleconferencing.

Teleconferencing's presence may not be as pervasive as some hoped it would be, but it will be an undeniable factor in the business world and has the potential to revolutionize education if integrated systematically. Thomas Edison (Schuller, 1986) had a similar revelation about the potential impact of motion pictures on education.

> I believe that the motion picture is destined to revolutionize our educational system and that in a few years it will supplant largely, if not entirely, the use of textbooks. I should say that on the average, we get about 2 percent efficiency out of schoolbooks as they are written today. The education of the future, as I see it, will be connected through the medium of the motion picture. . . where it should be possible to obtain 100 percent efficiency.

New Technologies in the Classroom

If someone who graduated from high school 30 years ago returned to that school today, it is likely that he or she would find it basically the same. With the exception of a few higher level courses, such as calculus or advanced placement classes, the subjects and the atmosphere have not changed. Computers, although commonplace, are not typically integrated in the curriculum. While most students have some access to computers, the actual rate of use by students and faculty is another matter.

This inability to react quickly to social change distinguishes schools from other institutions in society.

If that same person revisited a hospital, an airport, a business, or a restaurant, he or she would find that institution hardly recognizable, so advanced would be the methodology and technology employed in day-to-day activities. This inability to react quickly to social change distinguishes schools from other institutions in society.

In recent years, many schools have made valiant attempts to incorporate modern technology into the curriculum. Some authorities claim that a status quo mentality has eventually led to underutilization of technological innovations in education, thought by many to be the salvation of deteriorating school systems. Cuban (1986) noted similarities in the way teachers and schools responded to each of these "new" technologies. "In each case, these new devices were heralded by reformers as a way to revolutionize classroom instruction by increasing productivity. And in each case, the cycle of exhilaration/scientific credibility/low level implementation/disappointment was repeated," said Cuban.

Underutilized Computers. One of the splashiest technological changes to hit the schools was the computer. In the past, the schools used the new technologies as gimmicks--as public relations tools to give taxpayers the impression that they were up-to-date, forward-thinking, and relevant. In many cases, it was the local Parent Teacher Association (PTA) that acquired computers for the school.

Unlike the rest of society, the schools made the technologies conform to their traditional mind-set instead of letting the technologies change the fabric of the school system.

Parents were interested in schools purchasing computers because computers had made a great impact on their own jobs. The schools have not been the driving force in obtaining the technology. Unlike the rest of society, the schools made the technologies conform to their traditional mind-set instead of letting the technologies change the fabric of the school system. In the long run, these rejections have not seriously hurt them, but a similar rejection of the computer will have a serious and everlasting effect on the school vitality.

Once the computer is seen as an academic discipline instead of a recreational toy, it will begin to find its place in the school curriculum. As Boyer (1983) observed, "Using computers without knowledge is like using calculators without knowing the times tables." Tied to this shortcoming is teacher education. It is unfortunate, but most of the education departments in the nation's colleges are high on theoretical methodology and low on academic preparation. They are now sending candidates into our schools who are computer illiterates. As computers have become an increasing part of our lives, colleges have remained, ironically, in a status quo state in training teachers.

Unlike other educational innovations, the computer will not go away. It is, however, doomed to failure as an educational tool unless school systems take it seriously and insist upon computer literacy for both teachers and students. Never before have schools had to deal with a society that changes so rapidly. These exponential changes increasingly remove the school from society's mainstream. Only an honest look at the school's inability to accept change and a serious attempt to change its bureaucratic attitude will reverse this trend toward isolation.

Change in Education. In his treatise on historical perspectives of instructional technology, Schuller (1986) made an interesting conclusion:

> In education, as in most other human endeavors, lengthy experience does not necessarily bring about greater functional knowledge or improved performance. If you are not changing and adapting to new conditions and needs as time goes on, you're merely perfecting your old bad habits--and congealing the ideas that go with them.

This brings me back to the concept of people as the catalyst for change, not the technology. About 20 percent of adults are cyberphobic. They get sweaty palms, sinking feelings in their stomachs, and sometimes physical sickness when they face a computer. A Drexel University researcher (Travers, 1986) determined that many of these people are on college campuses.

A survey conducted by an office of scholarly communication and technology (Travers, 1986) found that computer use among universities had grown dramatically during the past few years: About 45 percent of all respondents either owned or had a computer on loan for their exclusive use, compared with only 2 percent in 1980. But some applications have been slow to take hold. For example, only 7 percent of the respondents reported having submitted manuscripts to publishers in machine readable form.

Advances in telecommunications technology continue to penetrate educational institutions at a rapid pace. The evidence, however, clearly indicates that the utilization and adoption of telecommunications technology has not been systematic. Planning efforts in general have been inadequate, and the results have been consistently less than encouraging. This is in sharp contrast to business, industry, medicine, and government, where advanced technology has dramatically changed traditional patterns of work.

Challenges for the Future

Several factors contributing to effective utilization and adoption of technology have been identified. They include:

- Cost and reliability;
- Training and support;
- Attitudes of students, teachers, and parents;
- Program availability;
- Scheduling conflicts;
- Autonomy within education; and
- Obsolescence.

Before these factors can be considered, a determination must be made as to the audience and the background of the audience. Only then, can teleconferencing be used appropriately and effectively.

High technology companies employ 20 percent of the workforce, but only 3 percent of these companies' workers need highly technical skills. We have a labor force of 104 million, but only 1 million high tech jobs. Of last year's college graduates, 20 percent found jobs that required no college training. A service economy has evolved in the U.S. McDonald's employs more people than General Motors. To compound the situation, mid-management or mid-level jobs are disappearing. In recent years, 617,000 jobs were created that required minimal training for cashiers. As an extreme example, a new McDonald's employee is trained in 10 minutes. The new employee is only required to match pictures with keys on the cash register.

A decline in fertility among white Americans and an increase in children born to black and Hispanic families will impact significantly on the next generation of workers. The fact that two thirds of the world's immigration is to the U.S. will also have serious implications for the schools and the economy.

Predicting tomorrow's job market will present a challenge; and perhaps in some small way, telecommunications technology may assist in planning and delivering the programs and services to reinstate the "classic" spirit of America. In the end, you might ask, "What does all this have to do with Wisconsin?" If you have not heard, the frost belt has thawed and the sun belt has dried up. Ask anyone who has been to Houston.

Wisconsin is where it's at!

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Communications Technology: Implications for Wisconsin

Ronald C. Bornstein

It was rewarding to see Louis Bransford (1987), national speaker for "The Future of Working Wisconsin" communication technology session, conclude his paper by remarking that the frost belt had thawed. While his remarks about the weather were symbolic, I was delighted that he said, in more literal terms, when one thinks about educational telecommunications, "Wisconsin is where it's at."

In fact, Wisconsin is not only "where it's at," but where it "has been" for quite some time, and where the potential for educational technology remains extremely bright.

Reaction to the National Perspective

Before describing some of the specific technologies currently used by Wisconsin's educational institutions, I would like to react to several points raised by Bransford (1987).

Bransford (1987) made an important point when he stated that a great deal of today's telecommunication technology has been dedicated to the commercial marketplace, either as a new tool for a trade or as a means to sell and deliver a product. It is not surprising to see private enterprise once again take the lead in introducing and adapting new technologies. They not only have the upfront risk money to win or lose in this endeavor, but also the need to be on the cutting edge--to beat their competition to the punch in prospecting new territory and tapping new revenue sources.

However, as William Paley, former president of CBS, once remarked about broadcasting, "Too often the machine runs away with itself instead of keeping pace with the social needs it was created to serve." Paley's caution is still appropriate today as we seek to maintain a balance between using technologies for profit and using technologies to improve the quality of society in general.

Like educational broadcasting, educational telecommunications is realistically determined by, and superimposed over, a predominantly commercial structure.

For example, Bransford (1987) pointed out that: "The ambitious projections, that demand for satellite teleconferencing services would far exceed the availability and supply of satellite transponders, have not been realized." While I would not disagree with that conclusion, it is important to discuss why that is so. From my perspective as an educational administrator, telecommunications consultant, and former broadcaster, it is clear that the apparent lack of demand is not just a lack of appreciation of teleconferencing's advantages itself, but it is also the cost of associated programming, uplink and downlink hardware, and satellite transponder time that must be considered. These high costs have been determined by the commercial marketplace. Like educational broadcasting, which is now public broadcasting, educational telecommunications is realistically determined by, and superimposed over, a predominantly commercial structure. Echoing Paley's caution, it has not kept financial pace with the social needs it was created to serve.

Similarly, I would take issue with Bransford's (1987) conclusion that the interactive video telesystem in rural Minnesota "demonstrates the quite recent arrival of fiber optics as a cost-competitive alternative to microwave, coaxial cable, Instructional Television Fixed Service (ITFS), and lower power television." While fiber optics may be cost competitive to those other technologies in the future, experience in Wisconsin indicates that is clearly not the case at this time.

When the state of Wisconsin bid its telephone system in 1986, three companies examined the possibility of using fiber optics or digital microwave to interconnect the state public television network. There was unanimous agreement by the three companies that neither of these options was competitive with the current analog microwave system.

Promise? *Yes.* Competitive now? *No.* We remain hopeful that these technologies and the commercial imperatives that drive them will soon resolve that situation.

Adaptation of new technologies is a costly process.

Bransford (1987) commented that: "Adoption of innovative technology is a relatively complex process." He (Bransford, 1987) described technological movement "...from a point of awareness to one of understanding." But, moving technology from awareness to one of understanding is only part of a broader continuum. That continuum must also take into account the need for sufficient funding. Adaptation of new technologies is a costly process, particularly in these sluggish economic times when new ideas must increasingly compete with maintaining the basic infrastructure of schools, colleges, universities, and all of state government.

Bransford (1987) also stated that: "...the equipment and materials available to students are archaic, traditional, and sterile." In my view this unqualified assertion lacks necessary documentation--at least here in the thawed sections of the snowbelt in Wisconsin.

Public education has responded to technological innovation with substantial change, perhaps not to the degree that we would like, but nevertheless to a point where classroom and laboratory equipment and materials are far beyond being "archaic, traditional, and sterile."

The university's boundaries were the state's boundaries.

Wisconsin's commitment and responsiveness to educational technology intensified about 70 years ago with radio station 9XM. Those experimental call letters in 1917 marked the beginning of the present WHA station, which subsequently evolved into the Wisconsin Educational Radio Network and the Wisconsin Educational Television Network. Radio station 9XM and its progeny were electronic extensions of the historic Wisconsin Idea advanced by Charles R. Van Hise, University of Wisconsin (UW) president from 1903 to 1918. The Wisconsin Idea was that the university's boundaries were the state's boundaries and that Wisconsin had a special obligation to share the fruits of research, teaching, and public service with its citizens, regardless of their location, educational, or economic status, in order to improve their quality of life.

Today, the Wisconsin Educational Communications Board, on which I serve as the representative for UW system President Kenneth Shaw, has the principal responsibility of overseeing radio and television's joint usage for the state's educational, informational, and cultural purposes.

Between 1947 and 1965, 10 educational FM radio stations were constructed to provide virtually all coverage of the state. In 1954, the UW was once again a pioneer when it became the licensee of the country's third public television station. It was joined 3 years later by the Milwaukee Area Technical College, licensee of channels 10 and 36. Since then, five additional, full-power television stations and several translators have been constructed to provide the same kind of statewide coverage as the state has for radio.

These stations form the backbone of one of the country's finest instructional and public broadcasting networks, providing credit and noncredit services that have educated and influenced Wisconsin's citizens in their schools, work places, and homes for almost a century.

This public broadcasting resource is only one of many telecommunications technologies being used by education throughout the state. In addition to *broad*casting, there is a whole range of *narrow*casting technologies now in place and in use.

The Impact of Narrowcast Technologies on Education

Narrowcasting technologies have several advantages over broadcasting. Some of them are:

- Educational institutions have greater control over who receives the programming; therefore, the programs can be better targeted to special clientele groups and better respond to special needs.
- User costs can more easily be identified and recovered since materials can be created for, or broadcast to, discrete audiences.
- Narrowcasting can more easily be interactive, providing two way communication between sender and receiver.

There are seven narrowcast technologies that will be most important to education in the future. Each will impact differently on education. However, their combined effect will improve the accessibility and quality of education.

Teleconferencing in and of itself is not a new phenomenon in Wisconsin.

Bransford (1987) represents the Public Service Satellite Consortium that is a national leader in teleconferencing, something which he termed as one of "the latest phenomenons that many educational institutions are now exploring." While this may be true in satellite video teleconferencing, teleconferencing in and of itself is not a new phenomenon in Wisconsin, since the UW and other educational institutions have been using audio and slow-scan video teleconferencing for over 20 years.

Educational Teleconferencing Network. The Educational Teleconferencing Network (ETN) started in the mid-1960s. Operated by the UW-Extension, it can be received by over 200 sites around the state, and each year over 35,000 people participate in credit and noncredit offerings. As part of a new state telephone contract, ETN will be receiving a new state-of-the-art teleconferencing bridge that makes the system even better.

Statewide Extension Education Network. The Statewide Extension Education Network (SEEN) links 27 UW campuses with two-way audio and freeze-frame video teleconferencing. This system was started in 1969. While not used as much as ETN, due to cost factors and visual limitations, SEEN staff are now examining several new alternatives such as adding color, computer-based visuals, and compressed video to the screen.

Cable. Cable is another technology used by several UW and Vocational, Technical, and Adult Education (VTAE) campuses in extending services to distant learners. It provides valuable information to credit and noncredit students; serves as a training ground for communications students, and reinforces or extends traditional study.

Instructional Television Fixed Service. This system, referred to as ITFS, is television service that uses low-powered transmitters and microwave transmission. The ITFS is another valuable telecommunications resource now being developed in Wisconsin. This service represents a significant co-venture by the public and private sectors with Wisconsin Bell. Under the agreement, Wisconsin Bell is financing capital construction costs for a statewide ITFS system in exchange for commercial use of the system's "excess capacity." In order to preserve and protect ITFS frequencies for educational use, the Wisconsin Educational Communications Board applied for ITFS channels in the state's 13 major metropolitan areas.

The ITFS will provide new communications capability for the state's educational agencies free of charge.

Once constructed, this statewide system will provide new communications capability for the state's educational agencies free of charge. Many of the VTAE institutions have been particularly aggressive in their use of these facilities and have developed some excellent programming for use by students in work settings. On the national level, the Public Broadcasting Service has created the National Narrowcasting Service, putting together a package of instructional programming specifically designed for ITFS use.

Sideband Technologies. Another interesting and potentially worthwhile venture is "sideband" technologies, which use part of radio and television frequencies signals along side the main broadcasting signals. In Wisconsin, sideband technologies have been used for some time. In radio, it is called Subsidiary Communications Authorization (SCA) and uses a sideband of the FM network. Currently, SCA is used for a reading service for the visually impaired, for K-12 instructional programming for 120 school districts statewide, and for selected UW-Extension programs. A wide range of sideband services such as data delivery and paging services is being examined.

In television, sideband technology is referred to as vertical blanking interval (VBI). Vertical blanking interval space is present in the television signals, but is largely unnoticed. The VBI is the signal space contained in the wide black line that rolls across an unadjusted television screen. In the past several years, the Wisconsin Educational Communications Board and the UW-Extension have taken a major national leadership role in the use of the VBI for educational purposes. One of the first uses other than for technical purposes, was a text service for the hearing impaired. This service included captioned programming and a second text channel for news and weather bulletins. In the future, several additional possibilities exist for the VBI such as:

- Expanding local teletext services;
- Distributing computer programming;
- Providing automated weather information directly from the National Weather Service; and
- Slow scan teleconferencing.

The UW-Extension Telecommunications Laboratory recently demonstrated this capability by sending a full color video picture over a VBI line in just 8 seconds. In comparison, it now takes the SEEN network 40 seconds to send a black and white picture using current telephone technology.

Multi-channel Sound. Also under active examination and experimentation in Wisconsin is multi-channel sound (MTS), often termed stereo sound. Multi-channel sound has several implications for public broadcasting, which include:

- Improved reception of public television's cultural and performance programming thus enabling all dimensions of great music and drama to be heard; and
- Using MTS as a second audio channel to offer programming in two languages simultaneously or to feed instructional programs on the main channel, while feeding interactive computer programming on the second audio channel. This programming could be downloaded for follow-up work by teachers or students.

Video Cassettes Recorders. There is also increasing activity in video cassette recording (VCR) technology. This technology has been around for some time and has exploded in terms of home popularity. Nearly 14 million VCR's were sold in 1986 alone, in addition to 80 million prerecorded video cassettes. Video cassette recorders have facilitated "time shifting" so that programming can be played back according to individual desires. Many educational institutions have used this time shifting ability for some time, especially in the area of instructional television. Now, the comparative cost for VCR's and the boom in video publishing has provided even greater flexibility in packaging educational materials for the distant learner.

A number of Wisconsin's television systems, including the Wisconsin Educational Communications Board, are taking advantage of the VCR's remote recording ability by broadcasting programs in off-hours. As an example, the UW-Madison, College of Engineering will soon experiment by broadcasting programs to students beginning at midnight and running until 5:00 a.m. The objective is to provide students who wish to take part in these courses the opportunity to record the programs using VCR's while they sleep or (in some cases) work.

Technology of the Future

I believe that these seven technologies at work in Wisconsin demonstrate, in contrast to Bransford's (1987) view, that Wisconsin and its educational institutions are adopting new technologies to reach students on and off-campus, using the technologies in disseminating information, and providing new and innovative opportunities for professionals to better manage their time and energy.

I agree with Bransford (1987) that we need to be cautious in approaching these technologies and that no single technology will ever solve all of the problems.

The boundaries of the Wisconsin Idea are no longer the boundaries of the state, but "the boundaries of our minds."

As UW system President Kenneth Shaw (1987) stated in his convocation address in February 1987, the boundaries of the Wisconsin Idea are no longer the boundaries of the state, but "the boundaries of our minds." New and emerging technologies will continually extend those boundaries as limited resources are stretched to effectively reach and influence citizens and improve the future of working Wisconsin.

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Structuring Expectations: Telecommunications in the 1990s

Dean J. Weston

Telecommunications has had a significant impact on each of us. Not only in our daily lives for personal and business communications, but also from the technological breakthroughs that evolved from telecommunications.

The transistor and the development of integrated circuits has changed all of our lives and spawned new industries. The total computer industry was developed from the basic technological developments in solid state electronic devices. New information and electronic technologies, developed in the last several years, are transforming the nature of products, manufacturing processes, corporations, industries, the academic world, and even our very culture.

I would like to share my thoughts on the ways technology has changed the telecommunications industry and to identify the impact on Wisconsin Bell's technical education requirements.

Advancements in the Telecommunications Industry

The waves of advancement and breakthroughs in the electronics field began in 1948 with the transistor.

The waves of advancement and breakthroughs in the electronics field began in 1948 with the transistor. From that point in time, the field of electronics and data communication witnessed a total transformation. What started as a minor tremor in the early 1950s, is now a full eruption of new technological applications.

In the 1940s, initial carrier systems were deployed with No. 1 Crossbar central office switching machines. The invention of the transistor in 1948 was the most important step.

In the 1950s, direct distance dialing (DDD) began. Initial laboratory demonstrations of color television took place. Local and central automatic message accounting for DDD calls was developed along with automatic number identification.

During the 1960s, analog data transmission began with the introduction of a series of new data sets using discrete electronic components. Touchtone dialing was also introduced. The Telestar satellite experiments were conducted.

In the 1970s, new technological breakthroughs in integrated circuitry caused rapid advancements. Digital facilities became dominant in the interoffice network. New electronic analog switching machines were introduced. New main frame and minicomputer processors became common in the network and in our operational support systems.

The development and deployment of microprocessor technology has changed our world.

The decade of the 1980s has literally been an avalanche of electronic developments. The development and deployment of microprocessor technology has changed our world. Digital and packet switches are now replacing the Electronic Switching System (ESS) analog switches of the 1960s and 1970s. Fiber optics is now the dominant facility for new inter-LATA and new interoffice facilities. Distributed processing is the dominant network design.

The History of Network Technology

Analog Transmission Architecture. Analog transmission is transmission of the human voice by an electrical wave form developed from a sound modulated carbon transmitter. The voice frequency derived is a continuous wave form transmitted over a pair of copper wires.

This particular architecture served the industry well for nearly 100 years of telephony. However, as the need for telecommunications dramatically increased, it soon become uneconomical to continue in the "one voice/two wire" environment.

During the 1940s, analog carrier systems were developed that allowed transmission of 2 to 12 carrier channels on a single pair of copper wires. These were frequency division systems, each channel being assigned a distinct frequency, similar to radio broadcasting. Analog carrier systems suffered from several transmission problems, including noise and phase distortion.

In addition, it became evident that analog had disadvantages when addressing the transmission of the ever-growing data environment. The disadvantages were directly related to the distance the signal was transmitted. For example, the signal to noise ratio decreased with the distance travelled and with the number of amplifiers inserted in the route. Large analog microwave radio systems still dominate the interstate network, but these carrier systems are being rapidly upgraded to digital fiber facilities.

Pulse Code Modulation. In the 1940s, Claude Shannon and Harry Nyquist (Fagen, 1978) at Bell Telephone Laboratories, worked in applied research for military radio systems. They developed a sampling theory that was the predecessor to "pulse code modulation."

Nyquist (Fagen, 1978) discovered that by sampling a telephone voice frequency of 4,000 cycles per second (CPS) at twice its highest frequency, or 8,000 CPS, and quantizing the signal to an encoded format of zeroes and ones, all information necessary to recreate the original analog wave form at the distant end was available. Pulse Code Modulation (PCM) provided a means to encode the analog signal and transmit the signal, noise and distortion free, by means of a series of framed zeroes and ones.

Through information theory, it was established that the maximum bit rate that could be transmitted over existing copper cable was 1.5 MBPS. By interleaving additional channels, 24 channels could be transmitted over two pairs of copper wires; one pair for transit, and another pair for receiving. This process is called time division multiplexing and was the basis for the 1962 development of the digital transmission facility called "T-carrier."

The T-carrier system gave birth to the digital hierarchy of transmission rates and is the backbone of today's facilities network.

The T-carrier system gave birth to the digital hierarchy of transmission rates and is the backbone of today's facilities network. Millions of dollars in additional investment in copper cable and new concrete duct work are being saved with T-carrier.

Pulse Code Modulation has not only allowed for the advent of T-carrier in our interoffice network, but also the "digital loop carrier" commonly known as pair gain systems. This system is employed in our loop plant from the central office to the customer premises.

The digital loop carrier reduces the number of cable pairs required between the central office and customers' premises, which may be quite distant from the central office. It allows for concentration at a remote terminal. For example, 96 customer lines require only 13 cable pairs from the central office terminal to the remote terminal.

In 1977, while the T-carrier was going through its fourth generation of design, a photonic revolution was quietly beginning in Chicago. The transmission of information via light pulses through glass fibers was being trialed. From this advancement, lightwave systems are being deployed in all major metropolitan networks to absorb growth demands.

In a lightwave system, the on/off modulation of lasers or light-emitting diodes produce the light or optical one/zero signal that goes into the fiber pipeline. At the receiving end, the optical signal is converted to an electrical signal by means of a photo detector. Significant, rapid improvements are constantly taking place in both input and output optical devices, increasing the operational rates into the gigabit range (1.7 gigabits per second, GBS). This allows for the transmitting of more than 25,000 voice circuits over a single fiber pair. If an 18-pair fiber cable were installed today between two cities at a 1.7 GBS rate, it could handle over 400,000 simultaneous conversations.

Fiber Optic Technology is Here. The advantage of fiber optics are numerous and include:

- High bandwidth;
- Immunity to electromagnetic interference;
- Low cost;
- High security; and
- Transmission of light signals 25 to 30 miles, without a repeater.

Fiber technology is advancing rapidly. A total new industry has developed in the past 5 years. There are more than 3,000 corporations in the fiber optics transmission business. In addition to using this technology in telecommunications, it has also been used in heart surgery by using lasers in place of the angioplasty process.

Applications, such as cable television, interactive full-motion video, and educational television, will ultimately require laying fiber lines to each user. Although fiber is technically feasible today, it is expensive.

Thus far this paper has focused on digitally transporting information over the facility. For more efficient operation of the network and cost savings, the need for analog to digital conversion had to be eliminated. Development of a digital switch, concurrent with the advancements in fiber technology was necessary.

New Digital Switch Needed. The first switching machines installed in the network were electromechanical. From the manual switchboards staffed by thousands of operators, the conversion to automatic switching began with the step-by-step machines installed from 1920 to the 1950s. Common control switching machines, No.1 Crossbar, No. 5 Crossbar, and No. 4 Crossbar tandem machines were installed in the larger cities during the 1940s and 1950s.

Electronic switching became popular in the mid-1960s through 1980, and now it is all digital. The Integrated Services Digital Network (ISDN) is a digital switch that includes both circuit switching and packet switching. Future switching machines will combine electronic, digital, and photonic switching. These machines will be faster and provide wideband switching.

Digital switches provide a versatile source of multiplexing capability that will allow future networks to integrate voice and data information.

Digital switches provide a versatile source of multiplexing capability that will allow future networks to integrate voice and data information. The basic switching technique involves multiplexing 24 analog voice channels, sampled, as in T-carrier, at 8,000 times per second, and switching octets of data through time interchanging and multiplexing switches.

A distinct advantage of a digital switch is in its ability to directly interface with the T-carrier facilities. It is not necessary to de-multiplex the 24 T-carrier channels down to a voice level. Rather, each serial octet from the 24 channels is switched directly through the machine on a time division basis.

The basic switch architecture is a time slot interchange switch, whose function is to transfer information from one time slot to anther between incoming and outgoing time division highways. The switch connects two lines by interchanging their respective time slots. The sample of the voice on channel one is switched to outgoing lines four and conversely. In the time division switch, there is no spatial movement. The computer is the software switch.

An enhanced version of the digital switching is called packet switching. In packet switching, datum is received in short, bursty lengths. On a serial basis, each received packet is switched through the packet switch by means of a distinct routing address associated with each packet.

The idea for packet switching originated over 20 years ago. The Rand Corporation, under military contract, developed a total security system for military communications. Each message was to be broken into bits, routed over different paths (on a mixed packet basis), and reassembled at a desired address. Technology of the day was not adequate for this. Now packet switching has arrived, and the mixed packet switch is a reality.

Digital switching has introduced a new major requirement--synchronization of the network. All of our T-carrier systems require synchronization of time clocks with their associated switching machines. All of the information, framing, and timing pulses must be translated in the proper context of time, to reconstruct the information transmitted error free.

As a result, a national network synchronization plan is evolving, where a local atomic reference frequency (a cesium beam frequency standard) is synchronized to a national standardized reference frequency in Hillsboro, Missouri. The cesium beam clock has an accuracy of 1 second loss in 31 centuries. Each digital switching machine should be locked to this standard via means of a digital link.

Rapid advancements in memory and switching component technology have made digital and packet switching a reality. Very large scale integrated circuit developments in the early 1980s have been a design key of the new switching machines.

Digital will be the dominant switching vehicle for the foreseeable future.

Digital will be the dominant switching vehicle for the foreseeable future. The next generation of switching machines will still be digital, but function with photons instead of electrons. Initial experimentation is already taking place using photonic switching. The principle advantage of photonic switching is higher speed (bit rate) and greater bandwidth through the switching machine.

Digital switching provides several major advantages over analog electronic switching systems such as:

- Network integration of voice, data, and video;
- Micro-electronics (reduced size-increased efficiencies);
- ISDN compatible;
- Broadband services-greater bandwidth than 1.544 megahertz;
- Flexibility;
- Modular growth;
- Switching rate (64 KBPS to 10 MBPS);
- Nonblocking networks; and
- Improved transmission.

Digital switching will introduce the intelligent network of the future; it will evolve from the new 800 service being offered in 1988. The 800 service is based on CCS or Common Channel Signalling System No. 7, as it is called.

The Intelligent Network. Common Channel Signaling is out-of-band signaling, where call set-up information is transmitted over a separate path and network to derive and establish a circuit through the network.

The new network is called intelligent, because the call processing function is not limited to the design of the local switch trunk; rather, call processing is performed by a separate packet switched network providing software-defined flexibility.

Customer services features provided by CCS System No. 7 and the intelligent network include:

- Display of calling number;
- Distinctive ringing designated by customer;
- List of call back numbers;
- Automatic call back to busy lines;
- Message service;
- Customer originated call trace; and
- Selective call forwarding and rejection.

Integration of Voice, Data, and Video

We are moving from the industrial age into the information age. As a result, there is a need to integrate voice, data, and video transmission into a digital format.

We are moving from the industrial age into the information age. As a result, there is a need to integrate voice, data, and video transmission into a digital format, and to be able to transmit these services over a conventional pair of copper wires to the central office without cost and need of multiple access loops. The system that will do this is the Integrated Services Digital Network (ISDN).

The ISDN is a set of universal network standards providing end-to-end digital connectivity. The International Telephone and Telegraph Consultative Committee's (1985) definition of ISDN is:

> A network evolved from telephony integrated digital network (IDN) that provides end-to-end digital connectivity to support a wide variety of services, to which users have access by a limited set of standard multi-purpose customer interfaces.

A high-level, conceptual view and key attributes of ISDN is a network capable of integrated voice and data over a single, twisted pair of copper wires. The ISDN includes digital switching offices providing many functions. The network of the future is an intelligent network with the ISDN-defined standards for inter-connection and transmission.

Keeping Wisconsin Bell Current. Wisconsin Bell has recognized its commitment to telecommunications consumers by implementing new technology. Wisconsin Bell began its evolution with the establishment of digital interoffice facilities. As of today, all of Wisconsin Bell's interoffice facilities are in fact, digital. In addition, Wisconsin Bell has a statewide digital radio route for its internal communications.

Wisconsin Bell first began placing digital loop carriers in Waukesha County, Wisconsin, in 1973. Now 92,000 customers are served on 859 systems. Of these, 859,386 are fiber facilities.

Wisconsin Bell has been a forerunner in the placement of fiber optic cable.

Wisconsin Bell has been a forerunner in the placement of fiber optic cable. From its initial use in 1980, 15,000 miles of fiber have been placed. The first fiber system was placed between two Milwaukee offices. This initial, multimode, lightwave cable had a transmission rate of 45 megabits. The 18-pair cable had an ultimate capacity of over 12,000 equivalent voice channels. The most recent placement was installed last year from Milwaukee to Waukesha. This 18-pair, 560 megabit, single-mode system has a voice channel capacity of over 145,000 conversations.

Wisconsin Bell has been a forerunner in replacing old switching technology. The company's five LATA access, digital, tandem switches have changed its analog network dramatically. Each switch acts as a LATA gateway switch and local tandem switch. The basic network fabric, thus, is a hybrid of analog and digital switching. Remote digital switching nodes, acting in association with a host digital switch, will be utilized to expedite ISDN services to business customers. In the near future, Wisconsin Bell will place a Siemens digital switch in Milwaukee. This switch will become the first ISDN switch placed within the state of Wisconsin.

Technology Advancements Dictate Product Lives. Replacement of Electronic Switching System (ESS) machines has been accelerating. They have become technologically obsolete in less than 10 years, because they require digital to analog converters for all facilities interfacing with the switching machine.

Wisconsin Bell's ability to modernize switching machines is limited by current depreciation. The projected life is dictated by the regulatory bodies. For ESS equipment, the projected life is 16 years and for digital it is 20 years. Competitors, offering similar services, generally use a 5 to 6 year depreciation life for their computer switches.

Wisconsin Bell is in a highly technical business. The extremely rapid technological changes are turning our network into a dynamic information network. New information and enhanced network services are being developed daily, as well as competitive alternatives, to ensure that "Wisconsin Bell is your high-tech connection."

The dramatic technological advances in telecommunications now places educational emphasis on digital theory, protocols, transmission, switching, and carrier facilities; photonics; and the data world. As a result, Wisconsin Bell has initiated several educational programs to increase internal and technical competency and participation in various academic programs.

Wisconsin Bell's Technical Education

Although Wisconsin Bell has internal educational facilities available, we have recognized the need to integrate both internal and external academia. Wisconsin Bell operates a technical training center in Waukesha, Wisconsin on a full-time basis with an average of over 3,800 student weeks of training per year. This facility offers instructor-led, self-paced, and hands-on laboratory environments. Students come from statewide Wisconsin Bell offices, such as Eau Claire, Green Bay, and Madison to attend technical courses at the training center. In addition, Wisconsin Bell utilizes the Bell Communications Technical Training Center at Lisle, Illinois, for 1,000 student weeks of instruction annually.

Internal company training, however, is dependent upon the academic foundation that students bring to the classroom.

Internal company training, however, is dependent upon the academic foundation that students bring to the classroom. Technical training is a building block process where each concept and skill must be mastered before progressing to the next step or level. A large percentage of nonmanagement people do not have formal technical training from a higher educational institution. As a result, these people may not benefit as much from the technical training they receive since they are missing prerequisite understandings of concepts and theories.

"Ready-Tech". To alleviate the lack of academic foundation, Wisconsin Bell has implemented a new program called "Ready-Tech," in cooperation with the Waukesha County Technical Institute (WCTI), Madison Area Technical College (MATC), and the Fox Valley Technical Institute (FVTI).

"Ready-Tech" maximizes the return on present in-house training and provides a foundation for acquiring and learning new skills. It is a corporate program that enables qualified employees to earn a 2-year associate degree through a weekend program of attending college every other Friday, Saturday, and Sunday. The employee receives full pay for the Friday that he or she attends school. The cost of tuition and books are paid by Wisconsin Bell. To achieve the 2-year associate degree, a 3-year commitment is required from the employee.

This program is open to all qualified management and nonmanagement employees. "Ready-Tech" demonstrates corporate commitment to assist employees in self-development.

Student Programs Abound. Other Wisconsin Bell student programs include a (an):

- "In-roads" program where minority college students work during the summer.
- College "Co-op" with Marquette University and Milwaukee School of Engineering students working an average of 20 hours per week.
- Summer-hire program for selected students from technical institutes. College students are given meaningful technical assignments and attend business meetings for an overview of a large corporation's operation and to observe basic managerial skills.
- Corporate tuition reimbursement plan that gives employees the opportunity to attend vocational or college programs. The plan encourages self-development by providing financial assistance to employees who voluntarily take off-the-job courses.
- Upgrade and transfer plan for nonmanagement employees. An employee may be upgraded based on his or her personal performance, skills, and technical qualifications required for a new job. Continued education is the best credential for gaining the qualifications to be considered for the next upgrade.

Cooperation Is Key for the Future

Wisconsin Bell's employee education profile must change to maximize employee contribution in a highly technical environment. The company's educational efforts assist employees in realizing their maximum potential. It is an investment in tomorrow's workforce.

"The Future of Working Wisconsin" depends upon integration of ideas and efforts between academic institutions and corporations.

"The Future of Working Wisconsin" depends upon integration of ideas and efforts between academic institutions and corporations. Continuous dialogue is essential, and common understanding of changing needs and focus will promote increased cooperation.

Structuring expectations for a working Wisconsin in the 1990s means defining:

- Corporate goals to participate in high-tech industries;
- Corporate utilization of new technology;
- The potential and inter-dependencies existing between corporate, academic, government, and individual missions;

- High-tech educational requirements for both the new workforce and our present workforce;
- Political support for innovation, education, and growth;
- New joint ventures between the academic and corporate world; and
- Freedom to compete.

In addition, structuring expectations for a working Wisconsin requires definition and implementation of an empowering people philosophy. This philosophy must recognize that Wisconsin's citizens are the state's most valuable resource. They deserve challenging and enjoyable jobs that provide satisfaction, personal growth, and adequate pay. Citizens must be valued for ideas and involvement and trusted to meet the highest standards of integrity. Accepting responsibility and a commitment to excellence in their work are characteristics that will help achieve corporate and personal strategic goals.

With this winning attitude, the people of Wisconsin will build an economic security and prosperity for "The Future of Working Wisconsin."

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SUMMARY OF PRESENTATIONS ON COMMUNICATION TECHNOLOGY

Speakers: Louis A. Bransford, Ronald C. Bornstein,
and Dean J. Weston

Technological advances in communications are occurring in both the public sector and private business. These advances affect daily routines, provide a medium to transfer services, and provide education and services to rural areas. Satellite technology has expanded tremendously over the past 30 years. Fiber optics are revolutionizing telecommunications, and telecommunicating with microcomputers is improving. In addition, interactive video telesystems are becoming cost competitive alternatives to telephone, Instructional Television Fixed Services (ITFS), and cable television. These innovations are altering education and expanding the number of potential students.

The educational and business market has not kept pace with the original expectations of communications technology. There is less emphasis on technology and more on applications, such as saving time, reaching more people, and promoting planning and material dissemination. More than ever, cost is becoming a primary determinant in the expanded application and use of telecommunications technology. In general, the telecommunications user community knows where technological applications can be made, but real cost and real revenue are the primary influence on technology use.

Teleconferencing and computers will proliferate in business and in education if they are integrated correctly. Educational institutions have attempted to integrate telecommunications technologies into their curricula because this technology can increase productivity. Education though, is not the driving force in technology application and this, in itself, will have a lasting effect on technology integration in business.

The educational system must deal with changing telecommunications technologies. Technological knowledge is not improved with experience but with a shifting educational base to technology. Contrary to what is occurring in business and industry, technological advances penetrate education in an inconsistent manner.

Although Wisconsin is a leader in educational technology, much of today's telecommunications technology is aimed at and used by private businesses seeking new territory and new revenue. Telecommunications is superimposed on a commercial base. New technologies are a costly endeavor to education as well as business. Consequently, the technology available to students is generally underutilized except for certain areas where it has been able to be incorporated into education. There is some imperative to provide education to all segments of the population regardless of location, which will impact heavily on the use of communications technology in Wisconsin. Wisconsin is optimistic in adapting communications technologies to enroll people in learning experiences. No single technology will resolve all the communications problems, but adapting communications technology is a solution to some educational problems.

CRITICAL ASSUMPTIONS AND ISSUES RELEVANT TO COMMUNICATION TECHNOLOGY

Assumption

Improved communications systems will be utilized as effective cost containment strategies for both business and education.

Issues

How can the VTAE system create linkages with business and industry to access equipment, facilities, and expertise to maintain up-to-date staff?

In what ways can emerging communication technologies best be used to provide alternate delivery of VTAE system programs and services?

How can the VTAE system develop cooperative agreements, partnerships, etc., with agencies, business, industries, and organizations to provide educational programs and services that will prevent/reduce duplication and identify gaps?

Assumption

New communication technologies will require a change in the way business and education systems provide service.

Issues

What procedures will the VTAE system implement to prepare VTAE instructors to acquire occupational and educational delivery skills needed to train workers?

What cooperative/consortium arrangements will the VTAE system need to make to access communications networks (uplink and downlink) to implement alternative instructional delivery?

ADDITIONAL RESOURCES FOR TELECOMMUNICATION TECHNOLOGY

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THE FUTURE OF WORKING
WISCONSIN

Computer Technology

There will be profound changes in the way work is performed over the next 20 years, triggered by the low cost of personal computers. Workers who now only use computers will become computer programmers, partly due to the coming widespread creation and use of specialized programming languages. Tedious jobs will be automated, often by the workers doing those jobs, who will then proceed to more interesting work. Education will have an important challenge in preparing students for a changing world and improving the skills of existing workers. Wisconsin, with its education, has a unique opportunity to take a leadership role in the adaptation of this new technology.

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Computers, Schools, and the Work Place

This text was edited from a presentation made by Harvey S. Long at "The Future of Working Wisconsin" conference.

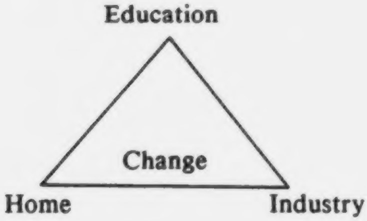
Computers were expected to turn the world upside-down. A computer revolution, which was predicted in many types of institutions, never took place. Computers have not been integrated into the world of work as much as originally thought.

Why hasn't computer technology done more to advance information and communication and become more a part of our daily lives?

The World of Work

There are many ongoing changes in technology. Technology operates within a system that is often responsible for the success or failure of that technology. Changes in technology reflect the use of computers in industry, education, and the home. These areas represent the world of work for today and tomorrow.

The World of Work



Computers are used in these areas to make work easier and/or more efficient, but so far their potential has been largely untapped. Computer technology must become an integrated part the world of work, if these areas are to advance and meet future demands.

Computers in the Work Place

An interesting concept in corporate America is referred to as the "installed base." The installed base may be tangible or intangible. It is something that a person or organization possesses, likes, and is reluctant to give up. The installed base may also be lucrative. Books are an example of an installed base in education. A well-known technology advocate stated at a recent conference that, "Technology will permit books to disappear by 1990." I might believe that, but the McGraw-Hill Book Company would not. Books are that company's installed base. McGraw-Hill makes money from books. Ninety-five percent of all learning today is print based so it seems that for now, the company's installed base is secure.

One the greatest problems in modern American industry is the advancement and protection of a company's installed base. Several parallels exist for education. Educators feel that the installed base for their field is experience. Many people save books and materials from high school and college days because they might be needed someday. Unfortunately, much of the past may be obsolete and no longer useful.

Technology Within Industry. The work world holds great potential for computers today, but much of that potential goes unrealized. A desktop microcomputer as a status symbol does not increase productivity. A computer must be accessible and utilized in order to reach its full potential.

At a minimum, 85 percent of all jobs today indirectly relate to computers. In the 1986 television program, "At a Loss for Words," U.S. Secretary of Labor William Brock said that, "Any job today that can be done by a functionally illiterate person will be done in the future by computers." I disagree. There are some jobs that are not vulnerable to computers.

The inappropriateness of computers to perform some jobs has not altered the prevalence of computers throughout the work place. At several industrial research laboratories, the ratio of microcomputers to employees is more than two microcomputers per professional employee. One of the first computer terminals that was developed used a typewriter that typed about 15 characters per second and was linked to a telephone. Today's computers have brought communication, publication, and computational functions together and made them readily accessible.

Education Within Industry. In the field of manufacturing, 75 percent of the workforce for the year 2002 are already adults. These individuals have left the formal education setting. Some of these people need to be retrained to maintain their jobs or become employed. To return to the formal education setting for retraining takes time, therefore, other methods besides formal education will need to be used.

The compelling reason for computers in industry is to save time. Technology serves as an efficiency mechanism, because time is so important and costly.

Technology in the Home

Technology has moved into the home in many ways. Telephones are present in 96 percent of all homes, while 98 percent have televisions. Microcomputers are entering the home in interesting ways.

It may be that students who have access to computer technology in the home have a distinct classroom advantage. That knowledge of microcomputers may be accelerating teachers to utilize computers in role model situations.

As in industry, the most compelling reason for microcomputers in the home is time shifting. Technology offers the opportunity to reallocate time saved from using computers to other important aspects of daily life.

Computers in the School

Education is included in the world of work because one of every four individuals in the U.S. is involved in education. Education itself, consumes 7 percent of the gross national product (GNP). The education that is provided through industry adds another 6 percent. However, the values of these investments are often debated.

A Washington Post article quoted U.S. Secretary of Education William Bennett as saying that too much money was spent on higher education. The article said that education will make peoples' lives 100 fold more productive. In contrast, Arthur Anderson of the Fairfield University in Fairfield, Connecticut, pointed out at a 1986 IBM education meeting that a college education today is worth 1.03 in the process of economic growth. That is, if the money spent on a college education for a student were invested and the student worked during the 4 years that he or she would be attending college, the student would have only gained 0.03 on their economic scale at the end of their productive life.

Work and Education Link. Work and education are extricably connected. Since computers are increasingly being used in the work place, what will happen to them in the school environment? The answer to this question will develop over an extended period of time because of a number of school and industry-related factors.

The length of gestation for any technology is related to the labor intensiveness of the sector in which the technology appears.

The length of gestation for any technology is related to the labor intensiveness of the sector in which the technology appears. The most labor intensive occupation in the nation is education. At their February 1987 annual conference, the American Association of School Administrators recommended that the number of school days be extended to 200 days per year. In a sense, their recommendation makes education more labor intensive. The more labor intensive, the longer the gestation period needed to implement a new technology. The result of using technology before the end of the gestation period is often disappointment and failure to reach claims.

Currently, 85 percent of teachers' time is spent delivering information. I believe that the future classroom will be an information-centered environment facilitated by technology. Industry will have several requirements for this classroom. Incoming employees will be expected to be able to:

- Acquire information;
- Synthesize information;
- Communicate information; and
- Learn on their own.

In order to meet these requirements, the schools will be required to address these skills through computers.

The Future for Computers in Schools. Because computers are a scarce resource, access to information and technology through computers becomes a concern. In order for students to use a computer for 30 minutes per day, the ratio of students to computers would have to be 12 to 1. The National Education Association (NEA) estimated in 1986 that the ratio was 50 or 60 to 1 computer. Access to, as well as the ability to adapt to advancing technology, become the major issues for the future.

If one of the school's roles is to prepare students for the world of work, then the computer will have to become a common element in today's and tomorrow's schools. The rate at which computers penetrate the school environment is dependent upon many reform issues. Among these are curriculum changes, faculty incentives, profit motives, and parent awareness. None of these by themselves will assure the successful use of computers in schools. All will require careful administrative orchestration to avoid the past's technological pitfalls.

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Computer Technology in the Next 20 Years: A Time of Enormous Change

John F. Beetem

The next 20 years will be a time of enormous change for computer technology. Computers will have a significant impact on the way people work at the state, national, and international level. While much of the impact will be due to new technology that has yet to be developed, a considerable impact will be due to existing technology that has not yet realized its full potential. An example of this is the personal computer. New computer technology will provide the opportunity to make dramatic progress in worker productivity and quality of products. The challenge will be to accept the necessary changes in skills and attitudes needed to realize these opportunities. Wisconsin, with its commitment to quality education, is in a unique position to address this challenge.

Changes in Hardware Technology

> *A computer that once required a room full of expensive hardware, now fits easily on a desk and is much less expensive.*

The last 20 years have seen an amazing amount of change in computer technology. A computer that once required a room full of expensive hardware, now fits easily on a desk and is much less expensive. All types of computer hardware, including processors, memory, disks, printers, and human interface hardware, have experienced dramatic reductions in size and cost. One of the most striking examples is memory technology, which in the past 20 years has advanced from the 1967 magnetic cores requiring one element per bit to 1,024 bit memory chips in 1977, and to its present state of 1 megabit memory chips. The price of each memory chip stabilized to roughly the same cost per chip over the years, but the price per bit of memory fell exponentially. Quantities of memory that would have been prohibitively expensive in the past are now easily affordable.

The improvement in computer chip technology was characterized by Gordon E. Moore in 1964 (Noyce, 1977). Moore predicted that the number of circuit elements in advanced chips would double every year. Over a 10-year-period, this would result in an increase by a factor of 1,024. History has proven Moore's Law to be correct, and there is reason to expect it to be true in the future. By applying Moore's Law, the probable future of memory chips can be extrapolated.

Probable Future of Memory Chips

Year	Chip size	Amount of information that can be stored in a chip
1967	1 bit	1 yes/no value
1977	1 kilobit (1,024 bits)	2 lines of text
1987	1 megabit ($1{,}024^2$ bits)	45 pages of text
1997	1 gigabit ($1{,}024^3$ bits)	100 450-page books
2007	1 terabit ($1{,}024^4$ bits)	100,000 books

According to this projection, in 20 years a single chip will be able to contain and allow instantaneous access to a whole library of information. This chip will not cost much more than 1 megabit chips or approximately $20. While this may seem incredible today, 1 million bits on a chip was equally incredible 20 years ago.

Similar improvements have occurred in computer processing technology over the last 20 years. The highest performance single-chip microcomputers available today (e.g., Motorola 68020, Intel 80386, and National 32000) exhibit performance levels that exceed most computers available 20 years ago and at one-thousandth of the cost. The most powerful large computers available today out-perform these micrcomputers in raw performance; however, the gap in performance is continually narrowing. Chip-level computers have an inherent potential for superior performance because they are small. Large machines are limited by the relatively slow speed of light, which only travels about 1 foot in a nanosecond or 1 billionth of a second. Since large machines must communicate data at the speed of light and over many feet of distance, the speed of light can be a limitation in practice. Chips are less than 1 square inch in size; therefore, the speed of light is not the limiting speed factor.

In the next 20 years, most computing is expected to be transferred from expensive, high-performance, general-purpose, large computers to small, inexpensive, high-performance, general-purpose work stations.

In the next 20 years, most computing is expected to be transferred from expensive, high-performance, general-purpose, large computers to small, inexpensive, high-performance, general-purpose work stations.

There will still be a market for large, parallel supercomputers designed to handle large computation problems. Some of these will be ultra-high performance specialized computers devoted to solving certain well-defined classes of scientific and engineering problems. The traditional, large, general-purpose computer will become less significant. Already, the price to performance ratio is in favor of small work stations, and within 20 years the raw performance of small machines will be superior.

Changes in Software Technology

The most obvious impact of these changes in computer technology is the explosive growth of personal computers from a quaint hobby 10 years ago to a multibillion dollar industry. There are millions of computers in use today in such diverse areas as education, small business, large business, government, agriculture, and the home. The word processing capabilities of home computers have nearly made typewriters obsolete. Home computer memory and processor capabilities match or exceed those of microcomputers and many large computers of the past 20 years.

A dramatic change wrought by personal computers is an enormous increase in the number of people using computers or wanting to use computers. Indeed, they are extremely powerful tools for many applications, and the low cost of personal computers has increased the number of opportunities for their use. Many powerful software packages, including advanced word processors, spreadsheets, and databases, can be purchased to program personal computers for particular purposes. These software packages have improved the productivity of many workers.

Difficulty in Microcomputer Programming. The enormous potential of personal computers has not yet been exploited, because computers are still too difficult to program. Most personal computer users are not able to program their own machines. They are limited to using purchased programs. Several problems with using prepared programs exist:

- A purchased program usually does not perform exactly the right function, so that the user must do additional manual work or hire a professional customizer.
- The user's needs change over time, but a purchased program will not be able to keep up with the changes.
- Purchased programs may not work in conjunction with each other. This is often true of "memory resident accessories," each of which assumes that it is the only program the user would ever wish to install.

- Purchased programs are mysterious. They often adopt surprising behavior that is not discussed in the so-called documentation.
- Buyers of programs are often subjected to new versions, which add additional functions, but sometimes subvert existing functions in mysterious ways and can cause considerable vexation to a user or an organization.

A purchased program is a "black box." It is not clear why it performs the functions that is does. Even worse, it is a black box made of "concrete," and there is no way to change things that are wrong. The user must simply learn the program's quirks and bugs and try to circumvent them. Unfortunately, the alternatives to purchased software are currently somewhat bleak. The first alternative is contracted software, where a person or organization is hired to produce software for a particular job. This is expensive, time-consuming, and has many of the same problems as mass-produced programs. Although it is possible to correct and update contracted software, it is difficult to do so since it was written by someone outside of the organization. The other alternative is for users and organizations to develop their own software. Again, this is expensive, time-consuming, and requires that users be able to program computers, which is currently a task that requires arcane skills and enormous effort. Historically, larger companies employ expensive, specialized staffs for this purpose. The small business person cannot afford to do this.

Owning a personal computer without being able to program it is grossly limiting its flexibility.

Future User Programmability is Essential. User programmability of personal computers is the obvious future path. Owning a personal computer without being able to program it is grossly limiting its flexibility. Computers are suitable for automating almost any tedious, repetitive task. These tasks can be identified in every organization. Leaving them unautomated, because no program can be purchased for automation, effects an egregious waste of human talent.

There is a great need for computer users who can program computers. Currently, this is not possible. Computer languages, dating back to the punched cards and steel tape systems, are simply not suited to most computer users. *This is not accidental.* There was no need for large numbers of people to be computer programmers. There weren't enough computers to go around anyway. Hoare (1984) characterized the modern programmer as a "high priest" who is familiar with the lore of programming through the use of a large number of "sacred books--which he [or she] alone is capable of reading." The programmer attains this exhaulted status through a long and laborious "sorcerer's apprenticeship," where myriad arcane details are committed to memory and myriad errors are made. There are no scientific principles that can be applied generally. It is certainly not a process that is attractive to most computer users; therefore, most elect not to become programmers. This is an untenable situation.

Modern programming practices will not be able to satisfy future computing needs, and because millions of people will want to use personal computers effectively.

Computer Revolution. John Backus (1983), an IBM Fellow, eloquently described the computing revolution that will occur as a result of unfriendly computer languages. In his lecture on "The Coming Revolution in Computing," Backus predicted a revolution, because modern programming practices will not be able to satisfy future computing needs, and because millions of people will want to use personal computers effectively. In order to do this, they must be able to program computers. According to Backus, the problem with programming is programming languages. They are either too complex to learn, such as PL/I and ADA, or are easy to learn but too complex to use, such as BASIC. His solution is a new form of programming called *functional programming*. Unfortunately, most people find functional programming languages even more challenging than conventional programming languages. Nevertheless, Backus (1983) identified the real problem to be programming languages.

The purpose of a programming language is to communicate desired behavior from a human to a computer. Since computers do not understand human languages, and humans find it difficult and inefficient to use a computer's machine language, programming languages provide a compromise between human and computer language. The closer the programming language is to the human's problem domain, the easier and more productive it will be for the human to communicate desired behavior to the computer. If the programming language is far from the human's problem domain, the human will be subjected to much repetitive, tedious work in translating each problem level concept into programming language. Each problem domain has its own set of jargon and notations, which are essential for efficient and precise work in that domain. Accountants, bureaucrats, chemists, doctors, engineers, farmers, lawyers, mathematicians, mechanics, physicists, and every other profession have their own notations. They are comfortable with their jargon and would find it difficult to communicate with each other without it.

Modern programming languages also have notations and jargon. However, the jargon of computer languages is that of computer science and includes such terms as pointers, variant records, byte-alignment, pass-by-value, and compiler [sic]. To program computers, a professional from another problem domain must learn computer science notation and translate a problem from his or her domain into the computer science domain. This process is often called coding, but as far as most people are concerned, it might as well be called "encryption." Once a problem has been encoded into a programming language, the original notation is lost, and it is much more difficult to understand, debug, and modify the program. These tasks are particularly difficult for someone other than the program's original author. Encoding of notations was not a problem in the past, since there were relatively few computers in existence, and these computers were programmed mostly by professional programmers who shared computer science jargon. It is the revolution in personal computers that is creating the need for noncomputer scientists to be able to program computers.

Many believe the solution is increased "computer literacy" on the part of the population. However, the problem is not that people are not computer-literate; the problem is that computers are not human-literate.

Many believe the solution is increased "computer literacy" on the part of the population. However, the problem is not that people are not computer-literate; the problem is that computers are not *human-literate*. Backus' revolution in computing will occur when people are able to program personal computers using their own notations. This will happen in the next 10 to 20 years. It has not happened before only because there was no overwhelming need. This does not mean that programming computers will be done using human languages such as English. This approach was already tried using COBOL and shown to have the same poor productivity as other programming languages. Most professional jargons and notations have only coincidental similarity to English. They are usually highly-constrained subsets of English with additional notations added. In 10 to 20 years, there will be an enormous number of special purpose languages for efficient and productive computing in specialized problem domains.

Future Computer Languages. Special-purpose, problem-oriented languages will be an exciting new development in programming languages. Until now, most programming languages have tried to be as general purpose as possible, with the authors of each hoping that their particular language will be adopted by the entire industry and make all the others obsolete. Because of their generality, general-purpose languages are awkward for any particular application. Specific-purpose languages will be targeted for specialized problem domains and will allow programmers to use the notations of that problem domain. Programs will not look like a foreign language to people in that specialty, although they will be hopelessly baffling to those outside the domain. Programming will be much easier. Understanding, debugging, and modifying programs will be far more productive, and will be without the frustrations of modern programming languages that produce such error messages as "literal queue overflow."

The challenging part of the specialized languages will be in their creation. Cooperation between computer science and specialized problem domains will be required. A noncomputer scientist has a difficult job creating a programming language and its associated tools, and a computer scientist has a difficult job creating a language for a problem domain other than computer science. There has been considerable success between computer scientists and noncomputer science experts in the cooperative construction of expert systems, so there is some hope for continued success.

The task of building program languages must be made much easier.

The task of building program languages must be made much easier. The most attractive solution is the use of an extensible language, which has a simple, general basis and can be extended to fit particular problem domains. Although all programming languages can have their functions extended to some degree through the use of user-defined subroutines and data types, there is currently no language available that allows its own syntax to be expanded to user-defined notations to the language. This has not been a requirement until now, since current programming languages have adequate syntax for handling computer science applications.

Special purpose languages, most in the form of simple, general-purpose, extensible languages that have been augmented with the notation and jargon of a problem domain, will become very common in the next 20 years. The availability of such languages will allow all computer users to become computer programmers who can solve their own problems. If a program does not perform the appropriate function, the user will simply modify it to do so. Sometimes the user will extend the language itself to meet the specific needs at hand better. The number of computer applications will increase explosively. Programs will be more useful, since they will be created by experts in an application domain rather than by computer scientists. Computer users will no longer be limited to running mass-produced software. They will be able to create the exact software needed and make inevitable modifications in the future.

It is crucially important for software to keep current with the technological advances in computer hardware.

Software Technology Must Keep Current with Hardware. These special-purpose languages will also benefit computer science. Particular specialties within computer science will be able to develop their own languages using their own notations and jargon, and improve their productivity by communicating more effectively with computers. It is crucially important for software to keep current with the technological advances in computer hardware described earlier. Unless software technology can advance with hardware technology, people will make inefficient use of hardware. For example, MS-DOS, the most widely used personal computer operating system, is unable to address directly more than 640 kilobytes of memory. Today, this amount of memory fits comfortably into just nine 1-megabit memory chips, yet the operating system and most programs using that operating system are unable to use more than 640K of that memory. While elaborate subterfuges, such as bank-switched memory and RAM disks, have been created to circumvent this limitation, the real problem is MS-DOS itself. It is uncertain as to when a version of MS-DOS will be created to address this memory. Another crisis will occur within 10 years as the billion-bit memory chips appear. High-end operating systems, such as UNIX, make the assumption that, at most, only a few billion bytes of memory will ever exist. This assumption will be refuted in the future. Software productivity must improve so that software technology can keep pace with hardware technology.

Many exciting technological changes will occur in the next 20 years, including practical speech and handwriting recognition, massively parallel computers having extraordinary performance, and I/O devices with amazing resolution and speed. High-productivity, special-purpose, computer languages will appear to make efficient use of these technological changes. Computing in 20 years will make today's computing look archaic; much as today's computing is revolutionary compared to that of 20 years ago.

Implications for the Work Place

Changes in computer technology will have profound impact on the way work and business is conducted nationally and in the state of Wisconsin.

Changes in computer technology will have profound impact on the way work and business is conducted nationally and in the state of Wisconsin. The most profound impact will be on productivity. Work tasks that were slow, tedious, repetitive, and otherwise nonproductive will become automated. A primary reason that they are not presently automated is due to the difficulty in designing and testing the necessary software. As described in the last section, this will not be a problem in the future.

Currently, many jobs are boring and repetitive. Although a great deal of repetition is necessary in the early stages of a job so that skills can be mastered, continuing a repetitive process wastes talent. At this point, it is most productive to automate the process as much as possible. In the past, such automation had to be done by computer professionals. In the future, such automation will be done by the skilled worker instead. After all, it is the worker who knows the job most intimately. With a special-purpose language designed for the worker's problem domain, the automation job will be straightforward, not requiring the worker to be a computer science expert.

> *Automating tedious tasks will allow for vast quantities of worker time to be used for more interesting tasks and learning new skills.*

Automating Tasks Will Not Eliminate Workers. At first glance, it would seem that workers are simply putting themselves out of work. However, this will not be the case: Automating tedious tasks will allow for vast quantities of worker time to be used for more interesting tasks and learning new skills. For example, purchasing agents will have the time to analyze exhaustively the available product offerings to determine the best products and vendors. Sales agents will be able to analyze customer's businesses in depth to better understand their needs. Tasks that were impractical before because of overwhelming labor costs will be undertaken and will have the important effect of improving the quality of work and products. Analyses of quality and productivity will be easily done. Implementing the changes suggested by such analyses will help organizations compete more effectively.

Perhaps most important is that work will become *change-oriented*. Each job will change over time as its tedious aspects become automated. Workers' skills will improve and expand over time. Such a workforce will be prepared for future changes in the national and world economy: Many such changes will arise from the technical improvements that were previously mentioned. Organizations that expect continual changes and adapt quickly to those changes will be in the best position to compete in the world market. Management will have to become change-oriented and encourage and implement these changes in the way work is done. To attempt to enforce the status quo in today's international economy is perilous--it will be even more so in the future.

We must return to our greatest strength--invention.

Inventions--Key to a Prosperous Future. Many economists believe that the nation's brightest economic future lies not in large scale mass production, but rather in smaller scale customized production. Foreign nations, primarily in Asia, have overtaken the U.S. in many areas of mass production. It is doubtful that the U.S. will be able to regain its lead in this area. We must, therefore, return to our greatest strength--invention. Our society's free and open nature has encouraged people to propose imaginative solutions to existing and often nonexisting problems. Most inventions fail for one reason or another, but many succeed and become viable products.

New computer technology, coupled with ongoing advances in manufacturing automation, will encourage inventions to proceed at a much faster rate. The inventor is someone who creates a new thing or way of doing things. Inventions can be mechanical, electronic, service-related, or of any other nature. Everyone is an inventor or a potential inventor. Advances in computer technology, especially special-purpose languages, will make it easier for an inventor to simulate inventions using computer models rather than requiring expensive and lengthy construction of actual models. Although simulation is used to some extent in large organizations, it is not used nearly as much as it should be, primarily because of the difficulty of producing computer models. Special purpose modeling languages and application of design database techniques will simplify this process, so that simulation will be used because it is easy, rather than because it is necessary. Computer hardware technology will make it possible for an inventor to afford the necessary computer resources. Extensive use of computer modeling will greatly improve the productivity of inventors and the quality and marketability of inventions.

Linking Computer and Manufacturing Technology. Once an invention has been designed and debugged using computer modeling, it is necessary to build real prototypes and begin manufacturing. Computer technology and automated manufacturing must join forces to gain enormous increases in productivity and quality. Flexible manufacturing cells will be able to implement prototypes on a greatly reduced time scale. The prototypes will *work* because they will have been carefully simulated beforehand. Quick turnaround on prototypes will allow designers to test prototypes almost immediately upon design release, rather than weeks or months later as is common today. Once the prototype has been approved, with or without quick-turnaround design changes, the design can be released to manufacturing. The entire process will take much less time in the future than it takes today, with a corresponding decrease in design cost.

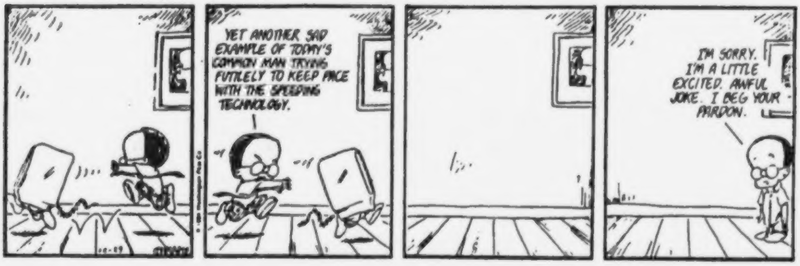
Quick-turnaround design, made possible by advances in computer and automated technologies, will catalyze the creative abilities of American inventors.

Quick-turnaround design, made possible by advances in computer and automated technologies, will catalyze the creative abilities of American inventors. No longer will they be hampered by slow design and testing of inventions. By reducing design costs, small-scale, customized production will become viable over mass production. Customers will receive precisely what they ordered giving a competitive advantage over mass production. Product lifetimes will continually shrink as technological advances make current products obsolete. Market winners will be those organizations that can place new products and services with obvious improvements on the market the fastest. Reduction in design costs will allow industries to adapt products and services continuously to the world market, encouraging them to react swiftly and effectively to the market's future challenges.

Wisconsin's Challenge

The primary certainty of the future is change. Computer technology will allow it, and therefore, it will happen. It must be decided if Wisconsin will be a leader in these future trends, merely adapt to changes as they occur, or ignore the changes entirely. Obviously, the last choice has been ruled out or "The Future of Working Wisconsin" conference would not have taken place. Therefore, the question is whether or not to accept the challenge of becoming a leader in exploiting present and future computer technology to improve productivity and quality dramatically. If we do not, another state or country will. The technology exists or will exist, and it will be used.

BLOOM COUNTY/By Berke Breathed


YET ANOTHER SAD EXAMPLE OF TODAY'S COMMON MAN TRYING FUTILELY TO KEEP PACE WITH THE SPEEDING TECHNOLOGY.
I'M SORRY. I'M A LITTLE EXCITED. AWFUL JOKE. I BEG YOUR PARDON.

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Wisconsin has a long tradition of progressive attitudes: Citizens encourage change and adapt to it readily.

Wisconsin is in an excellent position to assume a leadership role in exploiting this technology. The commitment to education, a primary ingredient for any application of advanced technology, is unsurpassed. The state has an excellent industrial base consisting of exactly the kind of smaller scale industries that can benefit most from vast improvements in design productivity. Wisconsin's large, skilled workforce and commitment to adult education encourages the workforce to expand its skills. Wisconsin has a long tradition of progressive attitudes: Citizens encourage change and adapt to it readily. Certainly, the infrastructure is in place to address the challenges presented by computer technology.

Education's Challenge. The primary challenge is educational. All workers must adapt to changing requirements and exploit new technologies as they arise. Training workers solely in today's skills will not be adequate. To be adaptable, workers must be able to learn new skills quickly. To be productive, they must teach computers how to help with jobs. Invention relies on creativity and problem solving, two skills that workers must possess.

At the primary and secondary school levels, curriculum in teaching these skills already exists, but it must be strengthened. English courses have the responsibility for teaching reading, reading comprehension, and literary analysis. These skills are required to learn new skills. Writing courses with rigorous attention to grammar are crucially important for teaching individuals to communicate clearly and to organize thoughts in a logical manner. Clear, logical thinking and writing are vital when communicating with computers or humans. Mathematics and science are equally important for teaching problem-solving skills as well as organized thinking. History is important in learning to adapt to change. Foreign language is excellent for improved communication and logical thinking. Computing courses can do an excellent job of teaching creative problem solving. The courses are in place, but full student participation and success in these curriculum areas is essential. Students must master communication and problem-solving skills or they, and ultimately the entire state, will be at a loss in competing with the rest of the world.

A major addition to the secondary school curriculum will be the design and use of specialized programming languages. These will supplant current computing courses for most students and will be developed within 10 years. Since students will have to use and modify such languages in future work, it will be important that these courses be part of the student's education. These languages will have impact on students' productivity and allow them to automate many tedious tasks now done by hand. This will not cause students to become idle: Teachers will simply require more creative and interesting work.

Specialized programming languages will have a major impact on all levels of education and other work.

Programming Will Enhance Education. Specialized programming languages will have a major impact on all levels of education and other work. Teachers will be able to improve their own productivity by programming in these languages. Many tedious educational tasks such as record keeping and grading will be automated. Most importantly, these languages will make it easy for teachers to produce high-quality, instructional software, a task that is currently tedious using existing programming languages. Increased use of computer instruction will allow teachers to spend more time improving their skills and will also help students who are having difficulty with their studies. Teachers will be able to tailor assignment and lesson programs easily to students' special needs. Computer cost will not be a problem, due to the advances in computer technology.

Vocational and adult education will have the important job of teaching the new computing techniques to existing workers. Once these productivity gains have been demonstrated; there will be tremendous demand for training in this area. Vocational education is often the best vehicle for teaching the practical use of new technology. New computer technology and specialized programming languages will be included in future curricula to equip future workers with additional problem-solving skills, therefore improving their productivity. It is the technical worker who often discovers problems in a manufacturing or design process. By expanding the skill base of such workers with new computing skills through technical education, it will be possible for workers to invent highly-productive and efficient solutions to these problems.

Application of new computer technology will be necessary to permit technical education to keep pace with the rapid changes in all kinds of technology.

Future computer technology will have considerable impact on vocational and technical education by improving the productivity of instructors, mirroring the productivity gains at the secondary school level. New courses will be developed more quickly and with less expense. Difficult technical concepts can be demonstrated through the use of computer simulations--currently a difficult and tedious task. Highly-specialized courses that could not be justified previously, due to development cost, will be considered. Application of new computer technology will be necessary to permit technical education to keep pace with the rapid changes in all kinds of technology.

Universities will continue to offer advanced education with both breadth of experience and depth in a single major. They will also have the task of teaching the computer technology that is making all of this possible. Fundamentals and applications of the technology will be taught at the undergraduate level. The graduate level will push the state of the technology to new limits. The University of Wisconsin (UW) currently has a large number of faculty in these areas. There are a number of organized collaborations at the Madison campus, notably the Wisconsin Center for Applied Microelectronics, the Center for Quality and Productivity Improvement, the Materials Sciences Center, and Manufacturing Systems Engineering. The computer science and electrical and computer engineering departments both have faculty developing computer languages. The UW is in an excellent position to lead the field in both training the workforce and advancing the state-of-the-art.

By starting now, the opportunity exists to have the state's population be the best prepared to cope with and exploit the many changes that will arise from future computer technology.

The UW has an obligation to assist the state in helping its population exploit the changes made possible by computer technology. This includes training teachers for primary and secondary education and training future business leaders to make the best use of the technology. People in all fields must be made to feel at ease and must become productive with specialized programming languages and other new computer technology. Scientists and engineers must be trained for research and development so that Wisconsin can originate much of the technology needed to maintain a competitive edge over other states and nations. By starting now, the opportunity exists to have the state's population be the best prepared to cope with and exploit the many changes that will arise from future computer technology.

There will be profound changes in the way work is performed over the next 20 years, triggered by the low cost of personal computers. Workers who now only use computers will become computer programmers, partly due to the coming widespread creation and use of specialized programming languages. Tedious jobs will be automated, often by the workers doing those jobs, who will then proceed to more interesting

work. Education will have an important challenge in preparing students for a changing world and improving the skills of existing workers. Wisconsin, with its education, has a unique opportunity to take a leadership role in the adaptation of this new technology.

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The Impact of the Computer Industry on Working in Wisconsin

Frank M. Groom

This paper addresses the future direction of the computer industry and the basic underlying changes in the work place structure. It also discusses the effects this industry will have on jobs within the industry, user data processing organizations, and the general business community served by the computer industry.

Technological Directions

The large mainframe manufacturers are currently introducing processors with power at the upper limit that most users require. These manufacturers have considerable capability to provide even more advanced processor speed and main memory capacity. Currently IBM's newly announced 3090-600 computer operates at 79,000,000 instruction executions per second and has memory of up to 256,000,000 bytes of storage and 1 gigabyte (1,000,000,000,000 bytes) of expanded storage. This, coupled with dual-density disk drives and the new cartridge tape drive, only lacks sufficient channel transfer rates to provide for most customer needs well into the future. And this does not take into account the expected expanded capability of the 1990 processors, increased disk density, and high-speed transfer potential. The large mainframe vendors have arrived at the inevitable position of outrunning the demand for large mainframe processing capability and are in fierce competition in the distributed marketplace.

We are beginning to think of the data much like information in a library, with all the basic storage, indexing, retrieval, and help associated with any large public library.

This plateauing demand for the dramatically increasing computer power is developing because companies are increasingly using processors as switchers that stand between users, with their own local processing capability, and central storage, which warehouses large amounts of corporate data. The concentration is thus shifting from processing to the data itself. We are beginning to think of the data much like information in a library, with all the basic storage, indexing, retrieval, and help associated with any large public library.

The basic trend in data processing today is driven by chip technology and network capability. These two technologies are pushing processing power all the way out through the network to the individual work station.

The basic trend in data processing today is driven by chip technology and network capability. These two technologies are pushing processing power all the way out through the network to the individual work station.

Currently 64k chips are standard in intelligent work stations; 256k chips have been used for memory expansion; 1 meg chips are beginning to be used; and most manufacturers have a 4 meg chip under development. IBM announced on February 17, 1987 that 1 meg chips will be their new standard for the RT and future personal computers (PCs). This will allow them to put up to 10 meg in one PC, and most of it on only one plug-in circuit board. Nippon Telephone and Telegraph announced on February 5, 1987, a 16 meg chip in prototype form. The implications for work stations are obvious. Certainly a card with four to ten 1 meg chips is formidable. But it will not be long before there will be a card with four or more 4 meg chips or multiple 16 meg chips. Addressable memory of 16 meg is the breakthrough point. At anywhere from 6 to 16 megs of addressable storage, a huge amount of software can be stored. This will allow employees to have powerful access and data refinement capability resident on their own work stations, and driven by local software, which is beginning to be called "companion software." This software acts in an intelligent way to accomplish data-oriented activities through menu selection by the user. From this capability, expert systems will quickly emerge that will perform the tasks management and professional workers do today.

Beyond the chip's enormous impact, the element that is most affecting future work is the wide variety of connectivity options.

Beyond the chip's enormous impact, the element that is most affecting future work is the wide variety of connectivity options. Packet switching, local area, and soon, Integrated Services Digital Networks (ISDN), are rapidly being placed to finally connect users to each other and to the large amount of available data. The technological capability here is tremendous and should soon permeate the entire work environment. The greatest potential lies in the creation of a public data network, whose capability parallels our public voice network. This opportunity is upon us and should soon be proving itself through competitive price and performance in the marketplace.

Changes in the Work Place

General downsizing of management staffs, elimination of management levels, decimating of supportive departments, and general reductions of management and office workers have begun with great top management enthusiasm. These follow the tremendous efforts of the 1960s and 1970s, which addressed the reduction of nonmanagement staff and production line workers.

We are now headed for the "three level company" composed of strategic planners at the top, a level of decision makers in the middle, and a wide range of technical/professional workers on the lower level.

We are now headed for the "three level company" composed of strategic planners at the top, a level of decision makers in the middle, and a wide range of technical/professional workers on the lower level. There will be little differentiation between management and nonmanagement at this technical/professional level, except in terms of pay and proficiency. This compression of reporting and supervisory levels is caused by the significant overhead cost of supervision, review, revision, and decision making added on to the production cost of professional workers. It is enhanced by technology, which allows for local creation of plans for analysis, electronic distribution to peers and decision makers, and electronic agreement on direction (in fact an electronic meeting of the minds). This technologically-assisted decision making will augment the level reduction already underway and continue communication and corporately-sensitized decision making, despite the obstacles of force and level reductions. This trend, accompanied by the implementation of decision support and expert systems, will empower a significantly reduced set of managers to run rather large companies efficiently and inexpensively.

Computer Industry's Negative Effect on Jobs

Within the data processing industry, rapid decline is occurring in the number of production workers manufacturing hardware, while there is a significant increase in software developers. These companies are the ones leading the way for the industry and its customers. These companies are the high-tech companies of the future--the big ones. Yet they are getting smaller rather than larger.

Our leading technological companies are pointing the way with tools, equipment, and strategies for reduction rather than expansion.

Our leading technological companies are pointing the way with tools, equipment, and strategies for reduction rather than expansion. For example, IBM will add 3,000 software engineers, but this will not offset their total reduction of 10,000 workers and managers. At American Telephone and Telegraph (AT&T) the numbers are even more extraordinary. Most recently there has been a new reduction of 27,000 employees, with more to come. Wang just dropped 1,000 employees. And DEC, although growing dramatically and hiring every available DEC-trained software technician on both coasts, is still holding the line on total employment. The company is shifting what job growth it had to utility software development jobs, while dropping production and support jobs.

The next area these companies will be addressing is their own build up of programming positions, which cannot be afforded at the current cost for the future. Software generators will have to surge into use to offset this bulge in cost.

Within customers' data processing shops, a major revolution has occurred. On the mainframe there has been a rapid movement from the use of COBOL for generating big application systems, to using fourth generation languages, such as FOCUS, RAMIS, and IDEAL to generate user-refinable systems. These systems work with data and augment the user's decision-making process. The power of the personal computer as a stand alone processor is quickly giving way to the strategic use of PCs as intelligent, programmable work stations connected through networks to other like work stations and to the central data repository. This is one of the causes of the dramatic decline in U.S. mainframe sales, growth, and therefore, production jobs.

Large programmer teams were used in creating and augmenting the large corporate systems built in the 1970s. But the cost of that kind of creation today is just too high.

Accompanying this is the rather dramatic decline in the basic programming team approach to system building and the position of "members" of a programming team. This is being replaced by individual analysts and programmers, doing their design and work separate from each other or in very small groups. Large programmer teams were used in creating and augmenting the large corporate systems built in the 1970s. But the cost of that kind of creation today is just too high. Application generators must be used in this area, so that this high-priced, labor-intensive cost pool is reduced. As a result, the management structures that supervise and guide programming teams are also slated for significant reduction.

Current computer and networking technology is directed largely toward the user community.

Current computer and networking technology is directed largely toward the user community. But the cost is very high. There are only two ways to pay for this technology, and the teams that support it and build systems with it. Either the resulting systems help generate more additional marginal revenue than the total cost of this technology, or more expenses must be reduced by using these systems and technology than they themselves cost. And the most direct way to save such cost is to force the reduction of sufficient jobs to pay for the technology. That is the hard-nosed business decision currently being made. The technology is being deployed. And due to international competition and its pressure on cost and job reduction, frequently broad costs and job reductions are occurring first. Then, in order to help the remaining force cope with operating the business, computer technology is being deployed.

Computer Industry's Positive Effects: Job Creation

There are a myriad of new jobs being created because of this change in technology and culture. They center around business analysis, data, networks for connectivity, distributed processors, local work stations, user training, and the whole process of users becoming personally involved in their own data processing.

There is a dramatic reemergence of the analyst as industry's critical growth component.

Business Analysis. The shift is clearly underway from technicians to analysts. Much of the technology arrives prepackaged. The problem is how and where to use it productively. There is a dramatic reemergence of the analyst as industry's critical growth component. Technology has outrun our ability to easily and routinely apply it. Now we need skilled people trained in determining how the vast plethora of available products and technologies can be put together to solve real business problems, reduce cost (people), and serve as a critical competitive factor in the marketplace. Distributed data-processing technology relies heavily on highly-skilled analysts determining proper deployment. And we are struggling with ways to assess, select, train, acquire, and utilize this required, skilled resource.

Data Specialists. Many jobs are emerging in this area. They start with the more mundane data operations management function of collecting data from various sources, including external and user-operated systems, as well as bulk extractions from mainframe production systems.

A new position, corporate data librarian, will help users acquire and interpret data, and act as a general user guide for the data, which is a powerful corporate resource. Also there is a mandatory requirement emerging for true data-base designers, a position that requires important and expensive training and experience.

> *With this growth in the data delivery capability will come increasing requirements for people who can design courses and teach users to think about business situations; to create business questions; and to qualify, extract, process, and present data for decision making.*

The need for data-base administration (DBA) is also reemerging. This function was set up in the 1970s and then abandoned as it became less important with production systems. The DBA is now becoming critical for information centers, relational data bases, and the whole spectrum of end user access to data. Information centers will grow from small user interface groups to full-fledged data delivery organizations. With this growth in the data delivery capability will come increasing requirements for people who can design courses and teach users to think about business situations; to create business questions; and to qualify, extract, process, and present data for decision making.

Distributed Processing. There is a whole set of positions, required to support distributed processing environments, which parallel the old traditional mainframe support and operations positions and are required in miniature to support, operate, program, offer service, and educate users. This will require new people and positions, because this environment tends to have different hardware, software, utilities, operating procedures, network connectivity, and user training requirements. These elements are frequently provided by nonmainframe vendors, even though these positions are the same, in kind, as existent mainframe positions. Thus when a company embarks on a distributed strategy, as many are doing today, the growth of positions that duplicate the mainframe group is unavoidable.

Emerging is a new breed of PC software experts, both skilled at creating their own software and at using available prepackaged software.

Local Work Stations. Emerging is a new breed of PC software experts, both skilled at creating their own software and at using available prepackaged software. Also emerging with business analysis are the skilled consultants and technology procurers for end users. Training, budgeting, and communication skills are required for this clientele. Also in demand are experts in local area networking and moving spreadsheets, documents, text, and graphics from one user to the next. Problem-solving "help desks" are an absolute necessity for getting the right people dispatched to solve the problem or solving them over the phone. Expert systems are in the early developmental stages to assist in this "help" requirement.

Conclusion

While traditional data processing jobs are disappearing, a new set of unique, individualized jobs are emerging. Many positions are also being built around the data, its delivery, and the network that must consistently, accurately, and expediently transmit data to the users' desks.

This technology is expensive; somebody has to pay for it. The most directly tapable source is the employee wage cost pool.

Also important is technology's effect on increasing sales, increasing profit per sale, and decreasing invested capital. But people and wage reductions are the easiest to relate to technology's introduction and will be directly affected.

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Manufacturing Must Key-In to Advancing Computer Technology

This text was edited from a presentation made by Gerald J. Lauer at "The Future of Working Wisconsin" conference.

The use of the computers in manufacturing industries differs greatly from company to company, depending upon their foresight, needs, and willingness to take risk. Computers in industry are becoming just as important as machine tools have been.

Computer Aided Design

A more recent trend has been to use the computer in engineering for computer aided design (CAD) or computer aided drafting. These design systems are not commonplace in industry yet, but are becoming more so as price decreases. Industry is using the computer's ability to memorize, construct, and reconstruct designs rapidly without errors. This all saves money. As Harvey Long (1987), national speaker for the computer technology session at "The Future of Working Wisconsin" conference, said, "Dollars are time in industry and everything revolves around dollars."

Computers are now solving common engineering problems in manufacturing plants. For example, developing a cam by hand is a long and tedious process. With a computer, the formula and parameters for the cam can be programmed into the computer and a drawing will result. Again, this saves dollars since accuracy is guaranteed. A person might make mistakes, but the computer will not, providing the data were entered correctly.

Computer Manufacturing

Computers are also being used in the manufacturing process itself. Machine tools have been developed that are capable of being set up by computers. Programs can be stored or changed at the touch of a button, thus reducing product cost and errors and increasing speed and competitiveness.

Computer Automation

Computers have been used in the automation of parts assembly for many years. However, highly technical advancements are now occurring in this field. A promising future is inevitable because manufacturers constantly strive to reduce product cost. Fifty percent of a product's cost is spent on assembly. Automation during the assembly process saves the most money because it is the highest cost activity. Other benefits result, such as:

- Better products;
- More efficient space utilization;
- Lower repair costs;
- Increased profit; and
- Enhanced competitiveness.

The current trend is to automate the entire process rather than just certain parts.

Assembly automation began in the 1950s and early 1960s with programmable controllers or electronically controlled switches and timing devices that were prearranged to control machines. However, the current trend is to automate the entire process rather than just certain parts. Such systems must be integrated with the computer so as to use its fast calculations and capabilities.

Computer systems can provide managers immediate and continuing access to production data or problems, sometimes even before they occur. Computers can inspect products for 100 percent accuracy and that saves companies money.

Automation Must Quicken the Pace Toward Technology

The field of automation and computerization has not developed as fast as necessary to keep pace with technology. This is because new technical equipment requires technicians and engineers, trained by the educational system for set-up and maintenance. Managers have not fully realized the complexity of computerization and automation of the manufacturing processes. They have not built the inhouse capability for set-up and maintenance.

American manufacturing management is terrible. It is the ruination of our country. It is our entire problem. Responsibility for this rests with boards of directors. Every question that comes before a typical manufacturing company's board is resolved by dollars. Two basic questions are asked: How does this expense affect dividends and capability and how will assets be protected?

No longer are the Henry Ford-type persons or the empire builders and entrepreneurs, running American industries.

These two questions are answered on the current basis rather than long-term basis. Boards hesitate to make long-term investments for long-term yields. The result is a bind on the world's market, thus reducing competition. Board directors are typically older and more conservative. There is more pressure to maintain high current profitability, but directors have only narrow views on how to do this. No longer are the Henry Ford-type persons or the empire builders and entrepreneurs, running American industries. The business of automation is almost at a standstill. But the daring will survive true industrial computerization and its manufacturing systems.

Training for Advancing Technology

More inhouse capability is needed to help alleviate this situation. The complexity of manufacturing tools is changing rapidly and engineers and technicians must be able to understand these systems. Before this can happen, employees must be able to communicate, both verbally and in writing and be technically competent to understand these systems. Manufacturers will not have the time or ability to teach these skills; schools must provide the basics.

More inhouse capability is needed to advance automation in industry. Electrically and mechanically-competent employees are needed. Business can hire people to program computers or design mechanical systems. But, the mechanically and electronically-capable employee will understand entire systems and save time in programming and maintenance, which in turn, saves dollars.

The technician of the past was a repairperson. He or she pulled the circuit board on a small bench-mounted machine to find a problem. It took half a day before production resumed. When multi-million dollar systems break down today, even for a few minutes, there is major concern. Thousands of dollars are lost unless the technician can identify the problem and fix it in minutes. Providing these technicians with the up-to-date training they need, will be education's greatest contribution to American industry and the future of the nation.

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SUMMARY OF PRESENTATIONS ON COMPUTER TECHNOLOGY

Speakers: Harvey S. Long, John F. Beetem,
Frank M. Groom, and Gerald J. Lauer

Technological changes have and will continue to systematically occur. For example, computer memory capacity is doubling about every 2 or 3 years. Wisconsin industries must adapt quickly to changing markets if the state is to have an opportunity to exploit new technology. The challenge is to make sure that technology solves a problem, rather than creating another.

Automation has never replaced people at the macro level, but the number of people required per unit of production has diminished. Time is the primary commodity that the three components of the world of work--industry, home, and education--have in common; and the computer is used in all three because it saves time.

The work place is changing. There has been a reduction from seven to no more than three or four levels of workers; a merging of technical/professional/production skills; data enriched work environments with more electronic meetings; fewer office/staff/management workers; a decrease in higher-paying production jobs and an increase in lower-paying service jobs.

Approximately 85 percent of today's jobs relate directly or indirectly to computers. Three-fourths of those persons who will be in the labor force in the year 2000 are already adults. In terms of computer professionals there will be fewer COBOL programmers, programmer teams, and programmers in management. New jobs will emerge, including business analysts who will focus on the analysis and political aspects of decision making; data specialists, such as data operations managers, corporate librarians, data base designers and administrators, and security managers; and helpers of others such as information center consultants, trainers, software consultants, connection specialists, and installers of mainframe applications, upload/download, electronic mail, and diagnosis/dispatch/repair. The manufacturing industries require people to keep automated systems operational and to communicate the technicalities of the electro-mechanical systems.

In education, classrooms are becoming increasingly information-centered with students learning more on their own, and learning materials being updated by diskettes. There are more important components of computer technology to teach than programming, because most workers do not program. The most important training is to teach people how to think about corporate problems.

CRITICAL ASSUMPTIONS AND ISSUES RELEVANT TO COMPUTER TECHNOLOGY

Assumption

Computer technology will greatly expand the information base available to managers and instructors in the VTAE system.

Issue

To what extent should VTAE instructors use computer-based information systems in the instructional process?

Assumption

Computer technology will greatly expand the level of computer proficiency expected of students from the VTAE system entering the workforce.

Issue

To what extent should the VTAE system incorporate basic computer literacy into industrial applications?

Assumption

Computer technology will continue to enable industries to automate their operations thus requiring current workers to be retrained.

Issue

What is the role of the VTAE system vis-à-vis business and industry in retraining workers displaced by the automation resulting from computer technology?

Assumption

The cost to the VTAE system of incorporating computer-related equipment (hardware and software) into instructional offerings is enormous.

Issue

What mechanism should be used in financing computer-related equipment costs?

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THE FUTURE OF WORKING
WISCONSIN

Aerospace Technology

The nation's space programs continue to direct new scientific endeavors toward the works of constantly emerging technologies. The capabilities of the Space Station and the visions that it will provide to future engineers will help ensure this nation's leadership in science and technology. This will, as in the past, transform and advance American society.

Stephen G. Cook
National Aeronautics and
Space Administration

Space Station: The Next Logical Step

Stephen G. Cook

The National Aeronautics and Space Administration (NASA) opened a new chapter in its history when U.S. President Reagan challenged it to expand man's horizon into space. In his 1984 State of the Union address, President Reagan gave the mandate to build a Space Station within a decade. In both the 1985 and 1986 State of the Union messages, President Reagan reaffirmed his commitment to this bold program.

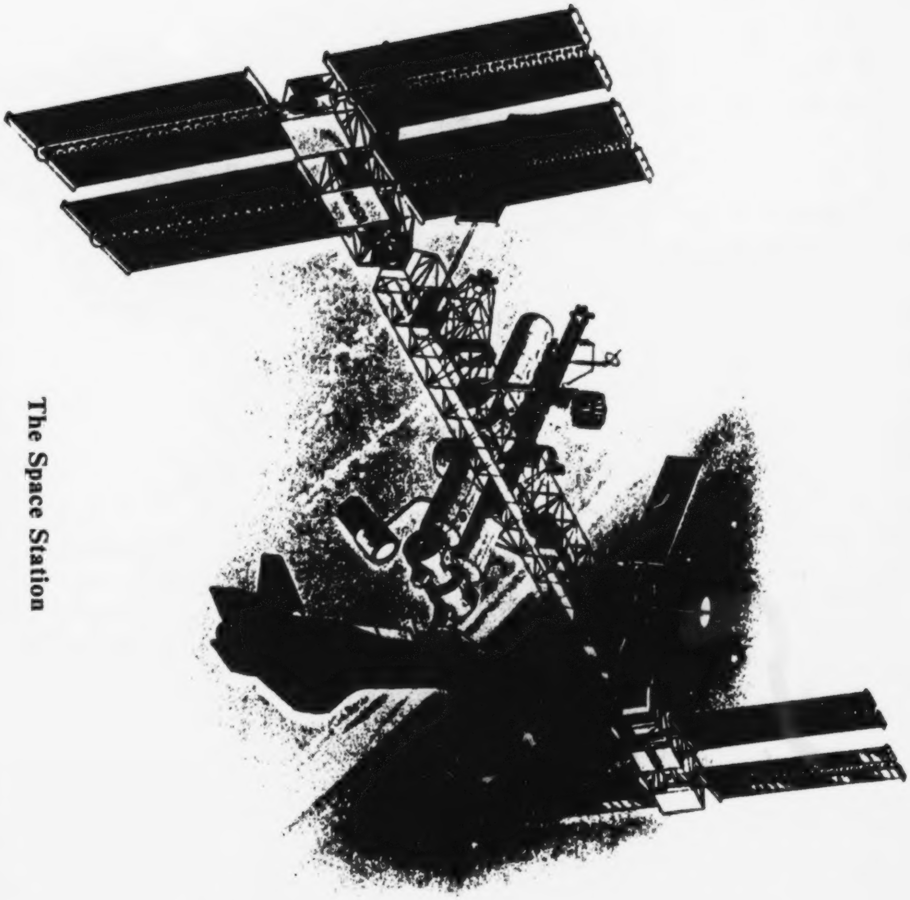
The Space Station program's overriding goal, shared by the U.S. Congress and President Reagan, is to assure U.S. leadership in space during the 1990s and beyond.

The U.S. Congress has also endorsed the Space Station idea as the next logical step in the U.S. space program by providing funding to plan, design, and build the Space Station. The program's overriding goal, shared by the U.S. Congress and President Reagan, is to assure U.S. leadership in space during the 1990s and beyond. This paper will discuss the Space Station program, its national importance, and its challenge to America's aerospace engineering community.

Program Goals and Objectives

The Space Station will be a multi-use, permanent facility in low-earth orbit. It will comprise both manned and unmanned elements, that will significantly enhance scientific and commercial space exploration. The Space Station program will initially develop a manned base and associated, unmanned platforms in low-inclination and near-polar orbits. The manned base will be launched in sections and assembled on orbit. The Space Station will be the centerpiece around which a major segment of the future U.S. civil space program will be structured. The purposes of the Space Station are to:

- Assure free world leadership in space during the 1990s;
- Stimulate advanced technology;
- Promote international cooperation;
- Enhance capabilities for space science and applications;
- Develop further the commercial potential of space;
- Contribute to pride and prestige; and
- Stimulate interest in science and engineering education.



The Space Station

As an evolutionary facility, it is anticipated that over its lifetime, the Space Station could provide a variety of capabilities, such as a (an):

- National space laboratory to conduct basic scientific experiments and develop new technologies, supporting commercial products;
- Permanent observatory for frequent Earth observations and possibly expanded and improved observations of the universe;
- Servicing facility for resupplying and repairing spacecraft and payloads and repairing and redeploying satellites;
- Assembly facility to prepare large space structures, satellites, and other spacecraft for operations;
- Transportation node from which large spacecraft and payloads may be stationed, assembled, processed, integrated, and launched to orbit;
- Manufacturing facility open to commercial endeavors for the production of new pharmaceuticals, materials, and other new processes;
- Infrastructure to encourage commercial investment in space;
- Storage depot keeping payloads, consumables, and spare parts in orbit for eventual use on spacecraft systems; and
- Staging base for deployment of future space missions to other planets, and perhaps, other solar systems.

The Space Station will be a highly capable, versatile system. Inherent in its design will be its capability to grow and adapt to future technologies. The Space Station will also give NASA the capability of meeting a wide range of its mission requirements as well as requirements of other agencies, private industry, the academic community, and industrial and international participants.

International Cooperation Strongly Encouraged

International participation is an important part of the program. When President Reagan charged NASA to develop the Space Station, he also extended an invitation to our space-faring allies to join the U.S. in building the Space Station and sharing its benefits. The countries of Europe, Japan, and Canada, have responded to this invitation enthusiastically by entering into written agreements to conduct joint definition and preliminary design studies. Bilateral agreements are now being negotiated regarding the hardware elements each partner will bring to the program's design phase. For instance:

- Japan will invest approximately $4 billion in hardware to join the program and will provide a general purpose module for all types of science experiments.
- Canadians will build the robotics arm like the one that they built for the shuttle.
- Europe is still negotiating to build a life sciences lab and possibly a man-tended, free flyer where astronauts could emerge from the Space Station to a co-orbiting platform.

In discussions with these partners, the U.S. has emphasized long-term commitments and significant roles for all partners, not only in the development phase, but also in Space Station operations and use of capabilities. The partnership is based on the principle that each partner will have access to the entire Space Station's capabilities. The functional capabilities of the hardware will be distributed to minimize duplication and maximize the capabilities of the initial Space Station.

Space Science and the Space Station

The Space Station will be an important facility, able to host a variety of scientific activities. It will be used for research and operation purposes, such as viewing and analyzing the Earth's solid surface, atmosphere, oceans, and ice.

Astronomical researchers are interested in the manned-base instrumentation for measuring crew interaction and Space Station resources such as power and data acquisition. Also, the long-term, observational periods that the Space Station will provide researchers is attractive. The life sciences community is planning research programs in basic biology and physiology as well as the effect of long-term exposure to microgravity conditions on plants, animals, and humans. Such work will be performed primarily on the manned-base, permitting the crew to serve both as experimenters and subjects.

The most scientifically promising field is in material processing in space. The commercial and academic user communities are enthusiastic about using the Space Station to conduct research into the microgravity processing behavior of materials. It is anticipated that such research will lead to pilot testing of plants and possibly the eventual full commercial production of materials in the Space Station's near-zero gravity environment. Materials of interest include crystals, pharmaceuticals, alloys, and analogs of cometary, planetary, and asteroidal materials.

Private Sector Investment in Space

The commercial potential of such activity leads to the third major role of the Space Station: To encourage private sector investment in space. The program has, from the beginning, carefully planned for the Space Station's commercial users and has assured that their requirements are incorporated into the overall Space Station design.

The National Aeronautics and Space Administration is exploring the possibility of having U.S. companies participate in the development and operation of Space Station systems and services with private funds, providing Space Station services to users for a fee. It has established policy guidelines for U.S. commercial enterprise regarding Space Station development and operation. The guidelines, which underwent extensive review by industry, provide the program's first step towards commercial participation in the Space Station program. The Space Station's role in space development is to:

Assure readiness to utilize the Space Station.

- Promote expanded level of science research and experimentation;
- Stimulate applications of interest to the private sector; and
- Develop opportunities for commercial utilization.

Pursue an advanced technology program.

- Maximize technology effectiveness;
- Maximize crew productivity through automation and robotics; and
- Transfer new technology to U.S. industry.

Encourage commercial participation in utilization, development, and operation of Space Station systems and services.

- Successful utilization should produce demand for additional space-based services;
- Commercial participation in the program would enable the private sector to supply additional resources;
- Industry participates in orderly growth of space infrastructure; and
- Beginning of a market economy in space.

Challenges for Our Space Future

The Space Station, unlike other NASA programs, will be a permanent facility. No longer will we simply visit space.

The Space Station, unlike other NASA programs, will be a permanent facility in space. No longer will we simply visit space. When the Space Station becomes operational, men and women will be living and working in space around the clock, every day of the year, well into the next century, for peaceful, scientific, and economic gain. The Space Station's modular, evolutionary character will enable phased, orderly growth to meet future requirements; some of which are clearly anticipated and others which are unknown.

A historical perspective best demonstrates the challenges facing America, and the future benefits for the nation. In 1940 there were no jet aircraft or supersonic flights. There was virtually no rocketry, atomic energy, or inertial guidance. Automatic computers were nonexistent. The thought of sending a person to the moon was still very much in the minds of science fiction writers.

In less than 50 years jet transportation and supersonic flights have developed. Astronauts have flown to the moon and safely returned. Human organ transplants are commonplace. High technology is an integral part of our daily lives. Advances in medicine, communication, agriculture, and transportation are taken for granted.

In just over 4 decades, engineers have gone from engineering traditional aircraft to jet and supersonic transportation; from the early days of rocketry to the Saturn launch vehicle; and from the Space Shuttle to the beginning of the Space Station. Each advancement posed new technological challenges that, when solved, became routine technologies that today are taken for granted.

The future will give us space planes, space stations, and yes, even interplanetary flight--the present topic of today's science fiction writers.

A glimpse of the past, highlights the effects the careers of today's scientists and engineers will have on society. The future will give us space planes, space stations, and yes, even interplanetary flight--the present topic of today's science fiction writers. These are the challenges of the future.

The nation's space programs continue to direct new scientific endeavors toward the works of constantly emerging technologies. The capabilities of the Space Station and the visions that it will provide to future engineers will help ensure this nation's leadership in science and technology. This will, as in the past, transform and advance American society.

Stephen G. Cook is a policy analyst in the Strategic Plans and Programs Division, NASA Office of the Space Station, Washington, D.C.

Wisconsin's Space Future

Eric E. Rice

Wisconsin is involved in the aerospace industry. This may be a surprise to many, so I would like to take this opportunity to describe some of Wisconsin's research efforts and the prospects for the future. Wisconsin's role in aerospace will be highlighted along with supporting, space-related educational activities around the state that will help build a strong space future.

Wisconsin's Fair Share?

Wisconsin ranks about 48th on the list of states that receive federal dollars for research and development (R&D) and goods and services. The state ranks much higher in the amount paid in federal taxes. We just are not receiving our fair share of federal dollars in proportion to Wisconsin residents' and corporations' payment of federal income tax. We must take steps to increase federal dollars to the state.

There are many areas and opportunities available for Wisconsin industry, not only in the space field, but many of the high technology fields that involve federal government procurement of goods, services, and other high technology items. This paper concentrates on space technology. The federal research dollars that we *do* receive gives us a leading edge in technology, which then can be used for commercial products. Through its programs, the Wisconsin Department of Development can enhance this development by supporting and teaching industry to attract federal contracts.

Future Space Programs

The major manned space programs that will dominate our civil space activities into the 21st century are:

- The Space Station;
- Space transportation;
- Space commercialization;
- The manned Lunar base; and
- The manned Mars base.

The major near-term program that Stephen Cook, national speaker for aerospace at "The Future of Working Wisconsin" conference, mentioned was the National Aeronautics and Space Administration's (NASA) Space Station program. In the area of space transportation, the Space

Shuttle will continue to dominate as launches are expected to resume in 1988. Expendable launch vehicles are back on the scene and will provide the driving force for space commercialization. Heavy lift launch vehicles based on Shuttle hardware elements will be developed soon and advanced space transportation systems that involve airbreathing propulsion will eventually dominate. A new area that has evolved is space commercialization. This has been driven by President Reagan and his desire to get the private sector more involved in the space program. The next major manned program after the Space Station will be either the manned Lunar base or the manned Mars mission, which could be a cooperative venture with the Soviet Union.

The Space Station. There are several areas for Astronautics Corporation of America's (ACA) possible involvement in the Space Station program. The Station's manned modules contain many displays to inform crew members of the Space Station's status and experiments being conducted. The ACA would likely be the contractor that provides those displays to the major primes, such as McDonnell Douglas, Rockwell, Boeing, and Martin Marietta. The Space Station will store cryogenics like liquid helium and liquid hydrogen. In Madison Wisconsin, We are working on cryogenic refrigeration systems that promise high efficiency. Computer systems are another area in which ACA can become involved. Perhaps the corporation's ZS-1 mini-supercomputer can be condensed and ruggedized into a flight version that can perform analysis on board the Space Station.

Space Transportation. The Space Shuttle is grounded temporarily until problems from the Challenger accident are solved. If you are in the Florida area, I recommend that you plan to visit Kennedy Space Center and see the Shuttle; it's a beautiful sight. ACA has supplied displays for Houston's mission control room and the Shuttle Astronaut Trainer head-up displays. ACA is also studying payloads that may eventually fly on the vehicle. We have been involved in assessing space flight's safety and environmental hazards.

In 1972, before the current Shuttle design was frozen, the Shuttle consisted of a two-stage, fully reusable system. At that time the U.S. Congress did not want to invest the extra upfront money to build this lower-cost operational system. This kind of system could eventually be built with staging advantages and total reusability.

A new concept in space transportation is the "Orient Express." This vehicle is the one President Reagan talked about as being able to fly from New York to Japan in a few hours or deliver crew and supplies to orbit. The "Orient Express" uses the atmosphere for its oxygen supply to burn with hydrogen fuel. Oxygen is collected and reacted with hydrogen as the vehicle is flown, thus the craft is lighter. The underside of the vehicle has inlets for the airbreathing propulsion engines that will allow the vehicle to take off on a runway, fly up to the atmosphere's lower regions accelerating under ramjet mode, go to supersonic combustion mode (or scramjet, which means that the fuel burns at a supersonic mach number), and then fly to orbit under rocket power. This technology is being developed by the Defense Advanced Research Projects Agency (DARPA), the U.S. Air Force, the U.S. Navy and NASA.

Astronautics Corporation of America's Space Transportation Section is also involved. We are analyzing a vehicle called "STARS," or Space Transportation Air-Augmented Rocket System. STARS is like a flying engine because the ten combined-cycle, airbreathing rocket engines surround the vehicle.

Space Commercialization

The NASA, commercial satellite companies, and the U.S. Department of Defense need to have access to space. We cannot rely on a three-vehicle Shuttle fleet.

Space commercialization in the expendable launch vehicle area has been accelerated due to the Shuttle Challenger accident. The NASA, commercial satellite companies, and the U.S. Department of Defense need to have access to space. We cannot rely on a three-vehicle Shuttle fleet when a failure shuts down everything for 2 years. To accommodate launch needs during the Shuttle redesign and recertification, President Reagan made a policy decision that all commercial satellites fly on commercial expendable launch vehicles. Small companies and major commercial companies like McDonnell Douglas who builds the Delta; General Dynamics and its Atlas Centaur launch vehicle; and Martin Marietta with its Titan, will be providing launch services on a commercial basis. They will be competing with the Europeans and the Japanese in this effort.

The Wisconsin Center for Space Automation and Robotics (WCSAR) is a new program in Wisconsin. In 1984, at President Reagan's direction, NASA announced a program to establish Centers for the Commercial Development of Space (CCDS). These centers combine universities and private companies with government to conduct mutually beneficial research leading to commercial endeavors in space. Universities benefit by spurring students' interests. Businesses become involved in new areas, and the government benefits from advanced space research.

The Astronautics Technology Center was established in Madison in 1984. At that time discussions with University of Wisconsin (UW) faculty led to potential directions of the center. Areas of interest included remote sensing, materials processing, and biotechnology. Because of ACA's interest in robotics and the UW's strength in robotics, it became obvious that space automation and robotics should be the thrust of a proposed Wisconsin CCDS.

In April 1986, Wisconsin's CCDS submitted a proposal to NASA; in August of that year, Wisconsin was notified that it was a winner of a $1 million grant. Ten companies committed resources to the program, and Wisconsin's governor committed to providing up to a quarter million dollars a year to industry through the Technology Development Fund. The grant is renewable on a per-year basis for 5 to 10 years. Nine centers have been awarded with six focusing on materials processing in space, two on space remote sensing and one (Wisconsin's) on space automation and robotics. Wisconsin's center has important implications for the state's future role in space such as:

- Advanced research can be conducted to promote space commercialization;
- Industry and UW cooperation can enhance relationships and increase Wisconsin's competitiveness in space research;
- Economic gains can be realized from patents on space products and services; and
- The center will promote Wisconsin's position in the space arena and hopefully help earn a profit for industry.

There are three projects in WCSAR that include the Maneuvering Anthropomorphic Robot System (MARS); the Automated Greenhouse Research Initiative in Space (AGRIS); and the Automated Lunar Resource Processing System (ALRPS).

Telepresence means that, as robot touches something, an astronaut-operator can feel it.

Maneuvering Anthropomorphic Robot System. The goal of the MARS program is to replace the astronaut with a machine that could accomplish satellite servicing and other hazardous work tasks in space. WCSAR would like to conduct experiments with the MARS-1 robot on the Space Shuttle in 1990 to 1992. The MARS robot will be used to conduct teleoperated work functions in a vacuum environment in the cargo bay. The UW is also developing new technologies in the telepresence area. Telepresence means that, as the robot touches something, the astronaut-operator feels it or senses it. If the robot feels a force, the astronaut feels a force. This allows astronauts to remotely operate a machine easily. WCSAR is also developing a dextrous hand that moves like a human hand.

Automated Greenhouse Research Initiative in Space. Growing potatoes and other foods in space is one of the goals of this project. There is the possibility that a large cylinder about 15 feet in diameter and 30 to 60 feet long could grow plants in space and be attached to the Space Station. We still have to learn to grow plants in zero gravity, to get nutrients to the plants roots, and harvest plants. We are also looking at growing plants in Lunar soil for the future Lunar base. The research could lead to new plant growth systems on Earth.

Automated Lunar Resource Processing System. The ALRPS project includes the concept of a lunar mining machine that would travel along the surface of the Moon collecting helium from soil for use in terrestrial-based fusion power plants. The helium and other gases impregnated in the soil from the solar wind over billions of years can be recovered. This program is probably 20 years away, but we can think of the possibility of actually mining the Moon, collecting the helium-3, liquefying it with magnetic refrigerators (currently under development at ACA's facilities in Madison), hauling it back to Earth, and selling it to the utilities as a fusion power fuel. Long before we would have a significant environmental impact on the Moon's surface, we could rely on Jupiter's atmosphere where there is an unlimited supply of helium-3. One Shuttle load of helium-3, enough to power all the U.S. electricity needs for a year, has an estimated value of $50 billion. This program would certainly be a commercial giant!

Another aspect of mining the Moon is for the production of chemical propellants. We have studied the processing of raw materials to produce hydrogen, oxygen, and aluminum power for NASA's Johnson Space Center. One of the problems is that the Moon does not have much carbon or hydrogen. Alternative fuels for propulsion systems must be considered to produce "inexpensive" lunar resources for propellants. A hybrid rocket where aluminum burns in oxygen is a possibility.

WCSAR Consortium of Companies. There are many companies involved in space commericalization. Among them are: Astronautics of Madison and Milwaukee, which is interested in systems integration and control systems and displays; Johnson Controls, Milwaukee, wants to provide batteries; Pierson Products, Janesville, will provide machine parts for some of the robot systems; Phytofarms of America in Dekalb, Illinois is interested in growing plants; Delco, Milwaukee, is interested in gyros and other systems; Silicon Sensors, Dodgeville, is interested in the sensors on the robot's fingers; Sundstrand, Rockford, Illinois, is interested in power systems; Madison-Kipp is interested in robotic implications for their manufacturing processes; Snap-On-Tools, Milwaukee, is involved in making robot tools; Gammex, Milwaukee is interested in laser positioning systems; and Beaver Dam Emerging Growth is interested in getting their community involved in these new technologies. Other companies and universities are expected to join WCSAR in the near future. This program is exciting and will significantly contribute to Wisconsin's future in space commercialization.

Lunar and Mars Base

Man was on the Moon in the late 1960s and 1970s, and we brought back samples. We learned a lot about the Moon and it's time we go back and stay there.

Man was on the Moon in the late 1960s and 1970s, and we brought back samples. We learned a lot about the Moon and it's time we go back and stay there. When one talks about moving off this planet to another heavenly body, the entire infrastructure (our food, every support system that you can imagine) has to be supplied. One of the reasons we are so much involved in this, or would like to be, is that some day we hope that we will be big enough to take on a major role in a program like this. NASA is moving ahead to do more work in this area. There is a Lunar symposium that Astronautics is helping organize with NASA Johnson Space Center and the AIAA in Houston in 1988.

In the state of Wisconsin there is a NASA-funded pilot program to study space-related activities. The manned Mars mission was selected as the main topic. Students from grades 9 through 12 submitted papers that dealt with some of the issues of a manned Mars mission, such as what it should be, what it should involve, how we would get there, why we should go, and who would pay for it. It is a competition and there may be some good ideas that came from these students. The winning team will be sent to the 1987 national "Case for Mars Conference" in Colorado this summer.

Astronautic's Involvement

Astronautics Corporation of America (ACA) was formed in 1959 and is primarily located in Milwaukee and Madison. ACA has produced many products, such as:

- General aviation instruments and autopilots;
- Secure data and communication systems;
- Computer maintenance for IBM and Zenith;
- Communications systems for information transfer;
- Instruments in the Shuttle Astronaut Trainer cockpit
- High resolution monitors for various applications in the medical field as well as mission control in Houston; and
- Electromechanical instruments used on aircraft.

Research at Madison's ACA office is very unique. We are working on magnetic refrigerators, wind profilers, supercomputers, and various types of space systems.

Professional and Educational Activities to Promote Aerospace

There are many programs supporting space-related educational and professional activities. The EAA Fly-in held in Oshkosh, Wisconsin, is an example. Space researchers from around the country will convene in Madison before the Fly-in to discuss recent aerospace advancements.

The Wisconsin Aerospace Education Association is involved in promoting aeronautics and astronautics aerospace education within the state. The "Young Astronaut Program" is a new program endorsed by President Reagan involving youth from kindergarten through 8th grade. Students move up various levels from mission specialist, to payload specialist, to pilot, and ultimately to commander. They learn all about space flight in the process.

The UW Engineering Mechanics Department is refocusing its courses more on the astronautics (space) area, someday leading to a degree in astronautical engineering.

The WCSAR distinguished lecture series is held monthly. Top experts in the field of automation robotics in space are brought in to speak; and, the American Institute of Aeronautics and Astronautics (AIAA) has started a Wisconsin chapter to focus on space issues.

Conclusion

I would like to mention that when I was in school at UW and knew I wanted to work in the aerospace field, the opportunity was not here. Wisconsin's educational system did not accommodate the space program at that time. I took as many space-related courses as possible at UW, but had to attend Ohio State University for the advanced training I needed. Many people have left the state for that reason. Now, times have changed. The message is clear:

> *Highly-educated aerospace scientists, engineers, and managers--you have left Wisconsin, because you could not find it here. It's time to come home and help us build Wisconsin's space future.*

Wisconsin's strong space future can become a reality!

Eric E. Rice is director of Astronautics Corporation of America's Technology Center, Madison, Wisconsin.

Space Age Technology

James C. Catania

There is a vast pool of information about America's aerospace industry. After reviewing hundreds of articles on the industry, it is almost frightening to see the nature of technical data available to both friend and foe alike for public review in our relatively free society. After a comprehensive review of the available literature, it is obvious that aerospace manufacturing has substantively impacted our daily lives. Even a lay person can recognize the advancements that have been made and that will continue in the future because of our quest to learn more about space and to locate a new source of resources.

One of the major industrial advancements of 1985 was a new composite material developed for use in space.

One of the major industrial advancements of 1985 was a new composite material developed for use in space. America's sidewinder missiles were having difficulty with the thermal coating peeling from their aluminum fins. The result jeopardized the missiles' accuracy. Similar problems were being experienced with the missiles' nose cones and basic structures within U.S. hypersonic jets.

In response to a space-related problem, General Electric discovered a process that combined the strength of steel with the stiffness of titanium. The result was a composite material that is actually lighter than aluminum and can be altered to meet designer specifications.

There have been many other remarkable developments. The most notable was the 1986 Voyager flight that capitalized on navigational advancements. The crew utilized a hand-held antenna pointed at a satellite, while communicating with Brazil about oncoming weather conditions. Weather information was not available through traditional methods and made the difference in this historic flight. It was not just the navigation system, however, that contributed to the Voyager's new distance record. It was also the plane's basic material, a lightweight composite, which enabled the Voyager to double the distance record previously set by a military aircraft.

This composite material can enhance precision performance in all industries. It may also result in a manufacturing boom for Wisconsin and neighboring states. General Motors, for example, spends $2 million on stamping dyes for the right quarter-panels of its vehicles. With plastic-forming tools made of these new composites, it can be manufactured for just $250,000. This significant cost reduction may increase Wisconsin's, and ultimately the nation's, ability to compete internationally.

In general, these lighter and more efficient materials will provide for more heat-resistant engines and more fuel-efficient automobiles. Although today's automobiles are approximately 15 percent lighter than they were 12 years ago, designers are targeting a weight reduction of 25 percent through utilization of the "super plastics" that will be fabricated as a result of this major breakthrough.

Still another new process combines ceramic glass with other elements to make a more durable, stronger, heat resistant ball-bearing that actually requires little or no lubrication! Although the new ball-bearing does cost more than steel, it is projected that costs will decrease over the next few years.

The new composite materials and fiberglass systems will all but eliminate America's reliance on imports and will enhance our communication systems.

In the past, there was a heavy reliance on the use of copper as a conduit and conductor. Again, the new composite materials and fiberglass systems will all but eliminate America's reliance on imports and will enhance our communication systems.

New composite materials will also impact medical technology. Bioceramics are totally resistant to blood clots and will bring about further breakthroughs in heart transplants. Bio-chips, enabling the merger of artificial skin and membranes, are being developed because of the nonrejection elements associated with the ceramic elements that make up the bio-chip. Even the new optics, the new sensing devices, and the new scanners contain composite materials generated as a direct consequence of space exploration advancements.

Agriculture has also experienced phenomenal change! The space potato, a soilless agricultural product grown in a space-like environment is but one example. Artificial seeds are being developed that contain insect-repelling characteristics. The concept of breeding crops to resist herbicides is incredible. Since 95 percent of Wisconsin farmers treat their crops one to five times annually with herbicides, the artificial seed could significantly reduce the cost of herbicides from $320 to $38 an acre.

There are hundreds of examples of practical and stunning applications of space-age technology, ranging from the design of helmets for the Olympics to tennis shoes' cushions.

The U.S. must reduce its production costs through the application of technology!

For Wisconsin, the issue is simply how to disseminate and apply the knowledge being acquired. The research systems of the University of Wisconsin-Madison (UW-Madison) and the application through the Wisconsin Vocational, Technical, and Adult Education (VTAE) system illustrates an effective delivery system that needs to be enhanced. While it is true that Wisconsin has doubled its production in the last decade, it is extremely difficult, if not impossible, to compete with the labor costs of Korea and South America. The U.S. must reduce its production costs through the application of technology!

There is a great deal of extremely valuable research being conducted today that is not being applied in our manufacturing plants. Machine tooling industries have robots and other automated manufacturing systems sometimes idle because older companion pieces of equipment cannot handle the modern units' speed and accuracy. Too many companies tout their 5-year-old personal computers, originally purchased for computerizing inventories, as significant advances in automation. In actuality, far too frequently, a person manually enters the data twice a year and the computerized inventory turns out to be something considerably less. In Wisconsin, a mechanism to link the research of the UW and the application and delivery of the VTAE system needs to be created and/or strengthened.

The need for skilled technicians and a rapidly deployable labor force will require more intense cooperation among all of us engaged in the public sector.

The need for skilled technicians and a rapidly deployable labor force will require more intense cooperation among all of us engaged in the public sector. State government must become less reactive and more proactive. Certainly we do not need more intrusion into the private sector, but state government can create and foster an environment that facilitates the application of research and knowledge through the dynamic delivery system of the VTAE districts in our state.

James C. Catania is district director of Blackhawk Technical College, Janesville, Wisconsin.

SUMMARY OF PRESENTATIONS ON AEROSPACE TECHNOLOGY

Speakers: Stephen G. Cook, Eric E. Rice,
James C. Catania, and Verner E. Soumi

The reasons for the National Aeronautics and Space Administration's (NASA) manned Space Station effort include: space leadership, technology stimulation, international cooperation, space science and applications, commercial potential, national pride and prestige, and science and engineering education. The Space Station will leverage U.S. competitiveness in automation (cognitive) and robotics (manipulative), as well as provide commercial development after its scheduled 1993 to 1994 completion. Wisconsin entities involved with NASA's effort include: Allis Chalmers, Astronautics Corporation of America, Cray Computers, Madison Magnetics, Medical College of Wisconsin, and the UW-College of Engineering in Madison.

Wisconsin ranks 48th nationally in receipt of federal funding for research and development and goods and services, but the many aerospace technology areas available make it possible for the state to increase its share of federal funding. The major future manned space programs after the Space Station include space transportation, space commercialization, a permanent lunar base, and a Mars mission. The Wisconsin Center for Space Automation and Robotics is particularly interested in remote sensing and value-added services, materials processing in space, and biotechnology.

In order to compete in aerospace technology more effectively, Wisconsin's public and private organizations must understand the goals of NASA and how NASA works, provide quality services by starting with small projects of superior performance, and not underestimate the test phase of any project's requirements. Most expenditures for space science are ground-based expenditures, such as UW-Madison's specialization is Earth system science.

A vast amount of aerospace information is now available. The impact of space technology on manufacturing has been amazing, particularly in the areas of composite as well as lighter and more heat resistant materials, fiber optics, bioceramics, and biogenetics. Technology transfer must be improved because valuable commercial applications of research are not yet available to manufacturers.

CRITICAL ASSUMPTIONS AND ISSUES RELEVANT TO AEROSPACE TECHNOLOGY

Assumption

The space technology industry could develop strongly in Wisconsin as a result of UW-Madison's research work.

Issue

How can cooperative educational linkages be developed between the UW system and its research capability and the VTAE system and its training capability?

Assumption

The impact of space technology on manufacturing will continue to be significant.

Issues

How can the VTAE system provide training and education that is responsive to changes in the work place precipitated by futuristic technology?

Will manufacturing's response to research require increasing amounts of customized training in vocational education?

How can basic skill deficits be addressed as more jobs require increasingly sophisticated and comprehensive training as well as faster training turn around time?

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THE FUTURE OF WORKING WISCONSIN

Energy and Natural Resources

> *I believe Wisconsin can become a national and global profit center for the development and distribution of knowledge, technology, and equipment required by nations and multinationals for proper environmental management and industrial efficiency. Wisconsin can carve out a "knowledge niche" in the global maketplace--a niche that has the potential to bring revenue from other states and nations to Wisconsin.*

Bruce B. Braun
Wisconsin Department of
Natural Resources

A Retrospective and Prospective Look at Some of the Nation's Resource Issues

Kenneth D. Frederick

The U.S. is blessed with relatively abundant natural resources. Our land and water resources have contributed importantly to the nation's economic prosperity, as well as to the amenity resources we enjoy. Lest we become complacent and assume that this will always be the case, a recent story in The Washington Post ("Earth's economic," 1987) warned that human activities are now pushing natural systems to the point of collapse, with potentially disastrous consequences for future generations. The Worldwatch Institute's fourth annual "State of the World" report (Brown, Wolf & Stark, 1987), the source of the story's pessimism, also concluded:

> As currently pursued, economic activity could be approaching a level where further growth in the gross world product costs more than it is worth.
>
> ...Questions of ecological sustainability are arising on every continent. The scale of human activities has begun to threaten the habitability of the earth itself...

Equally pessimistic views as to the impacts of human activities on natural resources and the environment received quasi-official status in "The Global 2000 Report to the President." This report (Barney, 1980), prepared for U.S. President Carter, concluded:

> If present trends continue, the world in 2000 will be more crowded, more polluted, less stable ecologically, and more vulnerable to disruption than the world we live in now. Serious stresses involving population, resources, and environment are clearly visible ahead. Despite greater material output, the world's people will be poorer in many ways than they are today.

The analysis and conclusions of "The Global 2000 Report to the President" (Barney, 1980) received widespread criticism and prompted Julian Simon and the late Herman Kahn (1984) to offer an opposing view in a book appropriately titled The Resourceful Earth. Simon and Kahn (1984) concluded:

> If present trends continue, the world in 2000 will be less crowded (though more populated), less polluted, more stable ecologically, and less vulnerable to resource-supply disruption than the world we live in now. Stresses involving population, resources, and environment will be less in the future than now...The world's people will be richer in most ways than they are today...The outlook for food and other necessities of life will be better... life for most people on earth will be less precarious economically than it is now.

As this conference considers "The Future of Working Wisconsin," it is important to ask about the contribution natural resources are likely to make to our well-being and employment opportunities. Of course, no one can know for sure what the future holds in store. Dramatic, sensational views, such as those quoted above, tend to make headlines and get reported in the popular media. But when presented with such conflicting conclusions, it can be difficult to even discern the direction in which we are moving. Unfortunately, the more careful research, which usually leads to less dramatic and often qualified conclusions, is likely to go unreported. Since my employer, Resources for the Future, performs such research, I welcome the opportunity to discuss some of these issues.

Even when we intend to look at long-term trends and to project several decades ahead, there is a tendency to attach undue significance to the latest crisis or boom. To help counter this tendency and to provide some perspective as to where we are coming from, I will begin with a brief look at how resource-related concerns have evolved in the U.S. This is followed by a prospective look at the adequacy of the nation's agricultural, forestry, and water resources, for meeting potential demands of the coming decades.

Historical Perspective of Resource and Environmental Issues

By the late 19th century many Americans were concerned about how rapidly the nation's natural resources were being depleted.

To the first settlers making their way across the country, resources must have appeared to be virtually limitless. They were certainly treated as such. Such appearances were misleading of course, and by the late 19th century many Americans were concerned about how rapidly the nation's natural resources were being depleted. It was generally agreed that the problems stemmed from the absence of restrictions on individuals and private companies seeking immediate enrichment. There was no consensus, however, as to the best solution.

Conflicting approaches for managing the nation's natural resources were advocated by groups labeled preservationists and conservationists. The philosophical differences between them continue to underlie debates on resource use. Both groups were concerned about resource depletion and placed much of the blame for resource depletion on the *laissez faire* approach to development that prevailed in the 19th century. Preservationists emphasized isolating special natural areas from further development as was done in 1890 with the creation of Yosemite, Sequoia, and Kings Canyon national parks. Conservationists on the other hand, stressed the importance of resources in the nation's development and opposed placing potentially productive resources, particularly renewable resources, offlimits to development. Leaving resources idle was considered wasteful, when they could be producing power, crops, or other goods. And reducing waste was viewed as an important government responsibility. Conservationists believed that a more activist federal role would produce benevolent, farsighted, scientific resource management.

Initially the federal government's role in water resource development was essentially restricted to the navigation projects of the U.S. Army Corps of Engineers. During the last quarter of the 19th century, however, pressures built for federal support of irrigation to promote western development. Irrigation was viewed as key to settlement of the arid and semiarid West. The Desert Lands Act of 1877 and the Carey Act of 1894 offered settlers low-priced land for irrigation. Yet by the end of the century, the outlook for continued expansion of privately-financed irrigation was bleak. In spite of federal incentives, private irrigation companies were under great financial stress. Moreover, the more accessible lands were already irrigated and continued expansion of irrigation would require even larger investments to construct dams, reservoirs, and diversion canals.

At the turn of the century, conditions were favorable for a more activist federal role. The conservationists gained political prominence under U.S. President Roosevelt and many of their ideas became law with the Reclamation Act of 1902. This act established the U.S. Reclamation Service, subsequently renamed the U.S. Bureau of Reclamation, which has helped transform the West by damming rivers and diverting waters to reclaim arid lands for agriculture. Currently, about 11 million acres receive full or supplemental water from federal reclamation projects.

Are Resources Depleting?

Although expressions of concern over the impacts of erosion on land productivity and water quality date back to colonial times, erosion received little attention as a national resource issue until the 1930s. Even the U.S. Department of Agriculture showed little interest until in 1928, a soil scientist named Hugh Bennett, coauthored a department publication, "Soil Erosion--A National Menace," and began preaching about the threat erosion posed to the nation (Bennett & Chapline, 1928). Bennett's skills as a communicator, along with the emergence of the "dust bowl," (which blackened the midday skies of Washington, D.C. at a time when the U.S. Congress was considering legislation for combating erosion), led to creation of the U.S. Soil Conservation Service in 1935 with Bennett as the first director. Throughout its history the agency has adopted the voluntary approach and has sought to encourage farmers, through incentives, education, and research, to adopt erosion control practices (Crosson & Stout, 1983).

The early 1950s saw a renewed concern about the longer-term adequacy of the nation's natural resources.

The early 1950s saw a renewed concern about the longer-term adequacy of the nation's natural resources. Several books with a resource scarcity theme appeared soon after the end of World War II, and the large demands for metals, timber, fuel, and other resources stemming from the Korean War made the concerns seem more urgent. In 1950 U.S. President Truman established the Materials Policy Commission, often referred to as the Paley Commission after its Chairman William S. Paley, to examine these issues. Among the commission's conclusions and recommendations, it was suggested that a permanent organization be established to examine long-range natural resource issues. Resources for the Future (RFF), which traces its roots back to the Paley Commission, was established as an independent nonprofit organization in 1952. The organization is dedicated to advancing research and public education in the development, conservation, and use of natural resources, including the quality of the environment.

The food and energy "crises" of the 1970s renewed concerns over long-term resource adequacy. Crop failures in some of the world's major producing areas in 1972 and 1974 sent food prices soaring to record highs, reduced global stocks to precariously low levels, and brought out in droves the neo-Malthusians who doubted that agricultural production could keep pace with needs. Removal of all production controls on U.S. farmers, however, contributed to record harvests in 1976 and 1977 and a quick return of the agricultural surpluses. Although famine in Africa and malnutrition in much of the developing world remain important concerns, these problems do not stem from an inability of global food production to keep pace with demand. The principal agricultural policy issues in the U.S. over the last decade, and for most of the past 4 decades, have centered around managing and reducing surpluses.

Although conservation has become much more prevalent, our basic dependence on imports and nonrenewable energy sources remains, and warnings of a new energy "crisis" in the 1990s are now being heard.

The energy crisis started by the Arab oil embargo in 1973, highlighted our dependence on imported and depletable energy supplies. Once the supply lines were reopened and consumers became accustomed to much higher energy costs, concerns about long-term availability of oil quickly dissipated. Although conservation has become much more prevalent, our basic dependence on imports and nonrenewable energy sources remains, and warnings of a new energy "crisis" in the 1990s are now being heard.

Environmental degradation became a source of widespread alarm in the 1960s. This was precipitated in part by Rachel Carson's (1962) Silent Spring, a landmark book that documented some of the environmental impacts of pesticide use. The environmental movement grew rapidly during the 1960s as polluted air and water and scared landscapes provided ample evidence and unpleasant reminders that our economic prosperity and expanding population were imposing high costs on natural ecosystems as well as on the quality of our lives. Legislators were forced to focus on the problems, and the 1970s brought a rash of environmental legislation. Starting with the National Environmental Policy Act of 1969, which was actually signed into law on New Year's Day 1970, a long list of environmental and resource management legislation produced a dramatic extension of the government's role into areas previously subjected to little or no regulation. A partial listing of the 1970s legislation included:

1970 - National Environmental Policy Act of 1969, Clean Air Act Amendments.

1972 - Federal Water Pollution Control Act, Costal Zone Management Act, Marine Sanctuaries Act.

1974 - Safe Drinking Water Act, Forest and Rangeland Renewable Resources Planning Act.

1976 - Toxic Substances Control Act, Fisheries Conservation and Management Act, Federal Land Policy and Management Act.

1977 - Soil and Water Resources Conservation Act.

1978 - National Parks and Recreation Act.

The resulting extension of federal control over resource use by the private sector conflicts directly with the Reagan Administration's aims of reducing the regulatory burden on private industry, relying more on the private sector and markets to fulfill social goals, and transferring greater responsibilities to state and local governments. Although the Reagan Administration has backed off from its early, highly-publicized efforts to sell off much of the public lands and to limit the powers of the U.S. Environmental Protection Agency, it continues to pursue, with some success, the objectives of easing regulatory burdens on private enterprise and expanding private access to the resources on government lands.

A Prospective Look at Forestry, Agriculture, and Water Issues

In the absence of a better understanding of long-term trends, public concern over resource adequacy will undoubtedly continue to fluctuate in response to relatively short-term events.

The policy struggle over resource and environmental issues is sure to outlive the Reagan Administration. Debates over such issues as the value of environmental amenities; nature of the threats to our natural resources and ecosystems; real costs of high-yielding, chemically-based agricultural production; and the proper mix of government controls and private incentives for managing land and water resources or dealing with environmental problems, will continue for the foreseeable future. Moreover, in the absence of a better understanding of long-term trends, public concern over resource adequacy will undoubtedly continue to fluctuate in response to relatively short-term events.

Agriculture and forestry are by far the largest users of the nation's land resources. The adequacy of these resources to meet future demands for food and fiber has been a recurring theme at least since Malthus. Although concerns as to the adequacy of our water resources may be more recent in origin, they have attracted considerable attention in recent years.

Before discussing these concerns, a brief explanation of what is meant by resource adequacy is helpful. Shortages of goods or resources would be one sign of inadequacy. But in a well-functioning market economy, as supply and demand change over time, price adjustments ensure that markets clear and the quantity supplied equals the quantity demanded. High prices attract additional resources to production of goods and curb demand for goods or scarce resources, thereby, preventing shortages from occurring. Under these conditions, resource adequacy has meaning only in relation to prices.

Thus, statements that the supply of agricultural or forest lands are inadequate to meet long-term demand seem to suggest that the real prices of these resources and the products derived from them are expected to rise over time. Rising land prices, however, do not necessarily imply rising prices for agricultural and forest products. With productivity increases, it is possible to produce larger harvests on a fixed or diminishing land base without rising costs. Unfortunately, I do not possess a crystal ball or even any special understanding that might enable me to foresee future trends and events. What I do have are colleagues who have studied the factors likely to impact the future prices of forest and agricultural products, and my own research on water resource issues. Drawing on this background, I will share some thoughts on the adequacy of the nation's land and water resources for meeting future agricultural and forestry demands.

While the following sections draw liberally on Pierre Crosson's work on resource and environmental issues associated with agricultural expansion and Roger Sedjo's work on the adequacy of long-term timber supplies, neither are responsible for the views and interpretations presented here. Both Crosson and Sedjo are senior fellows at Resources for the Future.

Forestry. Forest planners have traditionally assumed that the real cost of timber will rise indefinitely. A long-term trend of real price increases for some forest products offers some support for this assumption. Moreover, analysis by the U.S. Forest Service, concluding that the demand for forest products will rise faster than supply, suggests this trend might continue in the future. While common sense suggests that the real price of timber products cannot rise forever, it may rise for the duration of the relevant planning horizons of the U.S. Forest Service or private investors. To assess the likelihood of such an outcome, factors affecting supply and demand for timber products must be examined.

Historically, timber supplies have come largely from cutting old growth timber. The most accessible, least-costly stands were cut first. Over time, producers moved to sites that were either more difficult to harvest or more distant from markets. Productivity increases in most cases were insufficient to offset these cost increases, and the real cost of some forest products rose.

Currently, wood production is in a transition period from a state of drawing down stocks of old growth timber to relying on second growth and plantation forests. About 40 percent of the world's industrial wood output now comes from these latter two sources. This percentage will rise as large areas with very favorable growing conditions are planted with high-yielding varieties and subjected to more intensive management. The southern U.S., with excellent growing conditions; large stands of high-quality, naturally-generated timber; and significant new plantings, is becoming an increasingly important world producer.

A development with particular significance for Wisconsin has been the introduction of waferboard and oriented strand board that have greatly improved the economics of timber harvesting in the Great Lakes states.

As global timber output is increasingly produced on second growth and plantation forests, technology is likely to play an increasingly important role. Output per unit of land will rise with improved management techniques and the use of high-yield varieties. Moreover, technology can add lands previously considered uneconomic to the potential supply of commercial wood. A development with particular significance for Wisconsin has been the introduction of waferboard and oriented strand board that have greatly improved the economics of timber harvesting in the Great Lakes states.

Real price increases may also be curbed by slower growth in the demand for many forest products. The recent decline in housing starts may reflect longer-term demographic factors in the high-income countries and a closing of the gap between the stock of existing housing and the overall demand. Moreover, wood-saving technologies are enabling producers to fulfill some demands with less timber, and the development of new building and packaging materials is providing competitive alternatives for some wood products.

In conclusion, even though the case for anticipating long-term increases in the real costs of forest products has some basis in past experience as well as in the analysis and planning assumptions of the U.S. Forest Service, the arguments of growing resource scarcity and rising real prices for forest products are, at best, questionable. Even if real prices rise, the increases are likely to be modest, and there is no real threat of a timber famine in the foreseeable future. Moreover, it appears that the southern U.S. will be a globally competitive supplier and that the Great Lakes states will be competitive in some specialty markets. It should be noted, however, that these relatively optimistic conclusions as to the future availability of industrial timber say nothing about the problems of deforestation in the humid tropics and the associated species loss.

Depletion of Agricultural Lands. The experience in agriculture has differed from that in forestry. Growth in agricultural productivity has helped produce yield increases large enough to suppress market prices, while meeting the high growth in agricultural product demand. These gains, however, have not completely silenced the alarmists, who claim that we are in danger of running out of agricultural land and that shortages or much higher real prices lurk on the horizon.

Three principal concerns underlying the alarmists' claims are that prime agricultural lands are being lost to urban and other uses at an unacceptably rapid rate; that erosion is undermining the productivity of the land; and that the rate of growth in agricultural productivity is declining. Each of these is considered briefly below.

Farmland being converted to subdivisions or shopping centers is a familiar sight in many areas.

Farmland being converted to subdivisions or shopping centers is a familiar sight in many areas. Such conversions threaten the agricultural land base if they occur at high rates over long periods. The National Agricultural Lands Study (U.S. Department of Agriculture & U.S. Council on Environmental Quality, 1981), which concluded that on average 2.1 million acres of agricultural land were converted to urban and transportation uses and another 0.8 million acres were inundated by water every year between 1967 and 1975, lead many to conclude that this was indeed the case.

Clearly, net losses of agricultural lands of this magnitude over several decades would be cause for real concern. The figures used in the National Agricultural Lands Study (1981), however, were strongly criticized, and subsequent information suggested that they grossly exaggerated actual loss of agricultural land. Review of data as well as new information suggested that these figures overstated the amount of land devoted to urban areas by nearly 40 percent; overstated the rate at which agricultural land was being converted to urban and transportation uses by more than 100 percent; and failed to make adequate allowance for lands being converted to cropland from other uses. For instance, the total amount of land in cropland remained approximately the same from 1969 to 1978 as the amount of forest, range, and pasture lands converted to crops roughly offset the conversion of cropland to nonagricultural purposes (Crosson, 1986).

The more important social costs associated with erosion stem from its impacts on water quality rather than on agricultural productivity.

The quality of the land remaining in agriculture, according to the alarmists, is declining due to excessive erosion. Undoubtedly, erosion has severely undermined the productivity of some lands. How much of a threat erosion is to the nation's agricultural productivity is less clear, however. Studies suggested that erosion has had only minor impacts on agricultural productivity, especially in comparison to the major increases in productivity associated with new technologies. For instance, Crosson and Stout (Crosson, 1986) suggested that between 1950 and 1980, erosion reduced the growth of corn and soybean yields by about 4 percent but had no significant effect on wheat yields. In addition, soil eroded from one area is deposited elsewhere, and most of it remains available to support agriculture. The more important social costs associated with erosion stem from its impacts on water quality rather than on agricultural productivity.

The decline in growth of U.S. agricultural productivity during the 1970s contributed to concerns over the adequacy of the agricultural land base. Rapid increases in land-saving technologies during the 1950s and 1960s permitted large increases in agricultural output without any expansion of the land base. A permanent slowing in the introduction of or in the returns from such technologies would certainly add to the pressures on the land base. Diminishing returns from increased fertilizer applications, evidence of growing resistance to available pesticides, and the dependence of many irrigators on increasingly scarce water supplies, were all cited as reasons for anticipating a continued slow down in the growth of agricultural yields. To many experts, however, the prospects for genetic engineering, biological nitrogen fixation, and other possible technological breakthroughs, have produced considerable optimism about the prospects for continued productivity gains.

The demand side of the system is likely to place only modest new pressures on U.S. agricultural resources. The nation is already well, if not over, fed. Thus, domestic demand will not grow much faster than population growth or probably less than 1 percent per annum. While export demand could be much more dynamic, the competition for export markets is now fierce. The U.S. must be price competitive to achieve major increases in its share of export markets, and this will only be possible if the alarmists are wrong in their assessment of the inadequacy of agricultural land.

Evidence is abundant that high-quality water is becoming an increasingly scarce resource, particularly in the 17 western states.

Growing Water Scarcity. Evidence is abundant that high-quality water is becoming an increasingly scarce resource, particularly in the 17 western states. The West receives only about 37 percent of the supply, but accounts for 5 of every 6 gallons of fresh water consumed within the contiguous 48 states. Examples of growing scarcity include:

- Mining of the Ogalalla aquifer, which underlies the High Plains and provides water for about 15 million irrigated acres;
- Over-appropriation of the Colorado River;

- Southern and Northern California's continuing struggle over control of the state's waters; and
- Competition for water between hydropower, irrigation, fish, and Indian interests in the relatively well-watered Columbia River basin.

But examples of water scarcity are not limited to the nation's arid and semiarid regions. Many cities in the East are dependent on deteriorating and often inadequate distribution systems and/or are encountering problems in securing new supplies to meet growing water demands. New York City has declared water emergencies twice already in this decade, and concerns about water quality are widespread. Throughout the country, planners are encountering higher costs as well as resistance from environmental groups in developing new supplies.

All too often our water institutions encourage misuse and abuse, discourage conservation, and inhibit the reallocation of supplies in response to changing conditions.

There is little doubt that high-quality water is becoming even more scarce. Nevertheless, we are not running out of water and, fortunately, increasing scarcity does not necessarily imply that there will be a national water crisis as many have predicted, or that water shortages will seriously retard growth. Scarcity characterizes all resources. Water is a source of such concern, not because it is more scarce or has unique features and values, but because we often treat water as a "free" or nonscarce resource when it is not. All too often our water institutions encourage misuse and abuse, discourage conservation, and inhibit the reallocation of supplies in response to changing conditions.

Traditional, structural solutions (e.g., dams and reservoirs) to meeting long-term water needs are no longer adequate. The least expensive sources of supply have already been developed, and projects designed to withdraw additional water from streams are likely to come at the expense of valued instream water uses.

Water prices should reflect the scarcity of the resource and provide incentives to conserve and protect supplies.

Greater attention must be given to demand-side management. Water users generally pay nothing for the resource itself. They pay only for the costs of transporting it from its source to place of use, and these costs are likely to be subsidized. Water prices should reflect the scarcity of the resource and provide incentives to conserve and protect supplies. Institutions that facilitate water transfers among alternative uses are required to ensure that supplies are available on a timely basis to the areas with the greatest need. Thus, institutional changes are needed to prevent a water crisis and to ensure that water shortages do not impose undue constraints on a region's development (Frederick, 1984, 1986).

The current situation in the western states illustrates the possibilities for reallocating large quantities of water with minimal negative impacts on the sector giving up the water. Much of the water in the West now goes to low-value uses. For instance, 90 percent of the West's total consumptive water use is for irrigation and more than half of the irrigation water is used on crops for which the returns to water are probably less than $30 an acre foot. Large quantities of irrigated water could be conserved at relatively low cost (i.e., $10 to 30 per acre foot) through the use of water-conserving technologies such as tailwater recycling and laser leveling. In contrast, developing additional supplies through new dams, reservoirs, and canals will generally cost at least $250 an acre foot (excluding the opportunity costs of the water). Accordingly, large percentage increases in municipal and industrial water use can be met with small percentage decreases in irrigation use, and these transfers could be made with little negative impact on agricultural production. Providing irrigators an opportunity to sell water gives them an incentive to conserve, while also providing municipal and industrial users with a potential low-cost source of supply that does not impose further burdens on the instream and amenity values of the region's waters.

An implication of these conclusions with particular relevance for Wisconsin and the rest of the Great Lakes states is that there is not any potential market in the arid or semiarid West for water from the Great Lakes. The cost of shipping water between those areas would far exceed both the costs of conserving water and the marginal value of water within the West. Thus, the Great Lakes region will have to find another solution to the problem of rising lake levels.

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Energy and Wisconsin's Economy

This text was edited from a presentation made by Jeffrey P. Brand at "The Future of Working Wisconsin" conference.

Today, few people need to be convinced of the serious implications high energy costs have on economic growth. Two months after the October 1973 oil embargo, Wisconsin Economic Indicators (Wisconsin Department of Industry, Labor, and Human Relations, 1974) stated that, "The effects of the energy crisis began to show their presence in Wisconsin in December as people were laid off in aircraft, motor-auto parts plants, and chemical plants." Following the oil embargo, the world went into a recession, prompting many world-wide firms to cut production.

Wisconsin in turn, experienced material shortages that caused layoffs in the metal and machine producing industries. Additionally, slack national and world-wide demand boosted Wisconsin joblessness by heavy layoffs in the automobile, paper, lumber, and construction industries. Further, rising consumer prices, largely due to energy price increases, may have caused workers to become more militant in 1974. As a result, the strike rate increased 121 percent relative to the 1973 levels.

Between December 1974 and December 1975, Wisconsin experienced a decline of 42,000 manufacturing jobs. While it would be shortsighted to say that this decline was totally due to energy price increases, I think it is fair to say that it may have been the major cause.

Wisconsin's Energy Sensitivity

There are two conclusions that can be drawn from this paper:
1) Wisconsin employment is very sensitive to energy prices and
2) Wisconsin is resource vulnerable.

There are two conclusions that can be drawn from this paper: 1) Wisconsin employment is very sensitive to energy prices and 2) Wisconsin is resource vulnerable. Why? Because the state imports 95 percent of its energy resources. Some may disagree with my first conclusion, citing Wisconsin's economy as more diversified than the U.S. economy. Wisconsin would therefore be better able to sustain a recession. But, Wisconsin's basic industries, those that generate the initial cash flow in the economy, are very price sensitive. If these industries suffer, service sector jobs will also suffer.

In all, I feel that the conclusions are rather depressing, since another energy crisis would have a significant, negative impact on

Wisconsin's economy. This is supported by an energy index I developed that ranks an industry's energy expenditures in relation to its importance to Wisconsin employment. The following table provides the figures that were used to calculate the index. Column 1 shows total energy expenditures by 19 industries. Column 2 lists 1986 employment levels by industry. Column 3 lists energy expenditure by industry as a percent of total manufacturing expenditures. Similarly, column 4 lists employment by industry as a percent of total manufacturing employment. Column 5 takes energy percent by industry divided by employment percent by industry. The higher the number in column 5, the higher the energy use per employee. Column 6 shows an arbitrary classification of the industries into four classes according to energy intensiveness: very high, high, medium, and low.

Very High Energy Intensive Industries. This group includes paper, primary metals, food, and chemical firms. Collectively, these four industries spent $805 million or 63 percent of total energy manufacturing expenditures, on natural gas, electricity, and coal in 1986. In terms of employment this group employed 135,000 in 1986 or 26 percent of the manufacturing labor force. These industries would be hit very hard if an energy crisis struck Wisconsin.

High Energy Intensive Industries. This class spent $224 million and includes the fabricated metals industry, transportation, rubber, and stone and clay. High enery intensive industries employed 124,000 and had 18 percent of the total manufacturing employment. This group is also very sensitive to energy prices.

Medium Energy Intensive Industries. This group is comprised of only two industries, non-electrical machinery and electrical machinery. This class spent $171 million on energy and employed 148,000.

Low Energy Intensive Industries. This group is composed of eight industries. They collectively spent $69 million and employed 104,000.

1986 Wisconsin Energy Expenditures by Industry

	Total energy expend. (in mils.)	Employ. level (in thous.)	Energy percent	Empl. percent	Energy index	Energy group
Paper	$423	48.8	33	09	3.52	VH
Primary Metals	96	18.4	8	04	2.11	VH
Food	255	58.2	20	11	1.78	VH
Chemicals	30	9.7	2	2	1.26	VH
	$805	135.1	63	26		
Fabricated Metals	96	51.1	8	10	0.76	H
Leather	12	6.3	1	1	0.74	H
Rubber	47	27.0	4	5	0.71	H
Stone	13	7.7	1	1	0.70	H
Transportation	57	32.8	4	6	0.70	H
	225	124.9	18	26		
Non-Electrical	116	99.3	9	19	0.47	M
Electrical	55	49.3	4	10	0.45	M
	171	148.6	13	29		
Textiles	4	3.8	0	1	0.38	L
Lumber	21	23.8	2	5	0.36	L
Printing	28	39.4	2	8	0.29	L
Miscellaneous	5	10.1	0	2	0.18	L
Furniture	4	10.4	0	2	0.15	L
Instruments	2	11.2	0	2	0.08	L
Apparel	0	7.2	0	1	0.02	L
Petroleum	5		0			
	69	105.9	4	21		
TOTAL	$1,269	514.5				

Legend: VH=Very High, H=High, M=Medium, L=Low

Source: 1986 Wisconsin Department of Energy Statistics; Wisconsin Gas Company - Energy Forecasting Department; 1986 Wisconsin DILHR 790 Series

This reinforces the idea that Wisconsin's economy is very sensitive to energy prices. The trickle down effect from industry to industry would further compound the problem. I have taken the liberty, as an economist, to model and project the potential impact on employment under certain energy price scenarios. My model attempts to identify the impact of a 3 percent or 6 percent energy price increase on Wisconsin employment. Assuming Wisconsinites do nothing about energy prices; the following would happen.

Employment Losses Due to Energy Price Increases

Energy price increase, percent	Year	Number of jobs lost
3	1990	30,000
3	2000	70,000
3	2010	160,000
6	1990	70,000
6	2000	155,000
6	2010	260,000

The implications on employment are clear: The numbers more than double between a 3 and 6 percent energy price increase. This shows that Wisconsin is very energy sensitive, but what can be done to help our vulnerable situation?

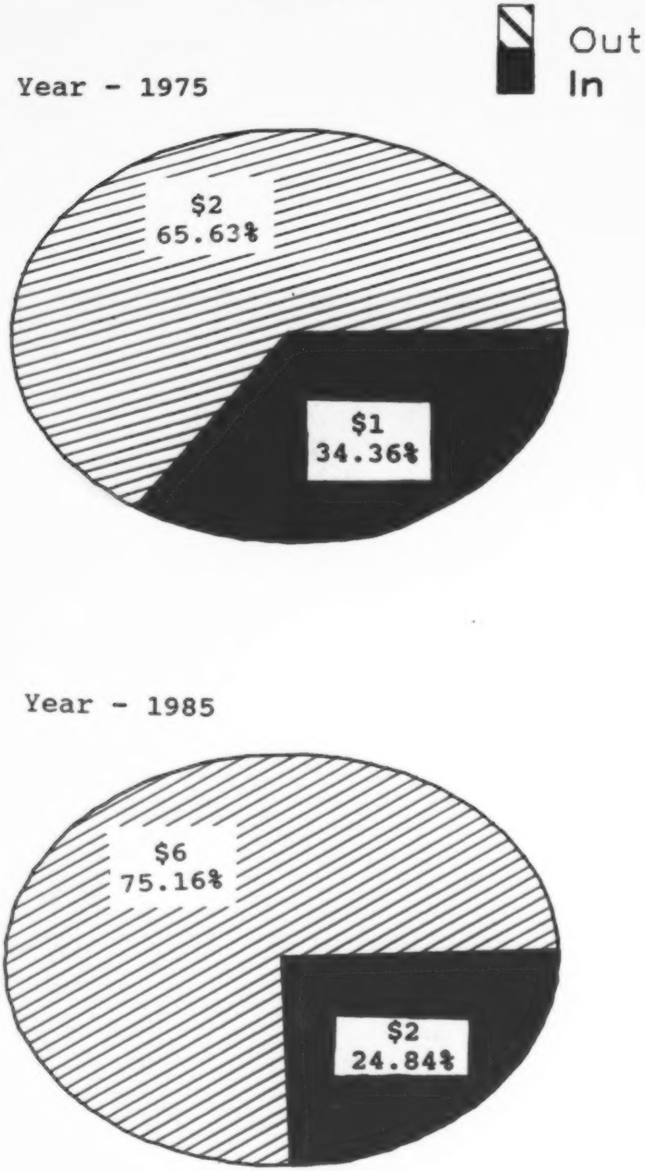
Why is our Energy Resource Situation so Vulnerable?

In comparing the amount of imported energy resources to actual consumption in Wisconsin, it was found that these numbers showed little change between 1975 and 1985. Energy resource importation increased from 2 to 4 percent, but still 96 percent of these resources were imported.

Two small but significant changes during this same time period also occurred: Oil consumption decreased thereby slightly reducing our dependence on this most vulnerable resource, and coal consumption increased. Coal is considered to be a prime resource or one that the U.S. can depend upon for hundreds of years.

The amount of money spent on energy resources is also important. Between 1975 and 1985 energy expenditures increased 130 percent. Probably more alarming is that the amount of expenditures leaving the state increased from 65 to 75 percent. The outflow money or money flowing out of the state was $6 billion and represented a net loss of 175,000 jobs.

State Energy Expenditures vs. Expediture Flow
(in billions)



Source: Wisconsin Energy Statistics, 1986.

There is no question that Wisconsin is resource vulnerable. But where are the risks? Oil, gas, coal, and nuclear waste all play a role.

Oil. The U.S. imports 35 percent of its oil and oil-related products. It is obvious that a slight fluctuation in the Organization of Petroleum Exporting Countries (OPEC) production can greatly affect U.S. oil prices. Even if there is only a small 10 percent cut in production, oil prices will increase 20 percent. And, our reserve base is declining. There have been no significant oil discoveries since 1968, when oil was found in Alaska.

Gas. I am concerned about the disorganized U.S. gas policy. Currently, the pipeline industry, which was always regulated, is going through deregulation phases. The effects of this deregulation are uncertain, but will have a major impact on the gas industry.

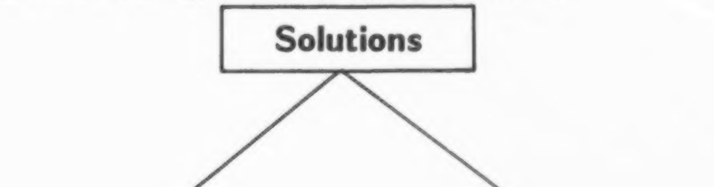
Coal. The eastern states are complaining about midwestern utility emissions that purportedly are causing acid rain, polluted ponds, and forest products to be killed. Legislation may soon be passed to curb the fly ash and sulfur dioxide that goes into the air.

Shipping costs also contribute greatly to the price of coal. The coal industry has shifted from high sulfur coal to low sulfur because of air quality regulations. There is not much low sulfur coal found in the East, where it was traditionally shipped cheaply on barges. Now it is shipped by rail at a much higher cost. Deregulation in the railroad industry may cause these prices to increase even more since the coal industry represents 85 percent of the railroad industry's revenues.

Nuclear Energy. We must be concerned about nuclear waste disposal. Wisconsin's nuclear power plants are being phased out because of waste disposal problems and radiation concerns. This represents another energy source loss.

How do we Prepare for the Future?

It is apparent that Wisconsin's energy resource situation is very vulnerable to outsiders' decisions--decisions in which Wisconsinites have a very minor role. How can we minimize the impact on employment if the various energy industries experience decline?



I propose two solutions centered around supply and demand. To insure adequate resources involving the supply side of the market and to lower spending considers the demand side, I propose implementing conservation programs to reduce energy resource demand and help needs to be met in-state. In turn, job growth could be enhanced. My recommendation includes:

- Maintaining the strategic reserve;
- Opening offshore oil leases;
- Increasing natural gas production; and
- Increasing wood usage.

Maintaining the Strategic Reserve. We have already built up a 496 million barrel reserve base in abandoned salt mines. If imports were cut off completely, we would be able to sustain that import level for 1 year.

Opening Offshore Oil Leases. There is a lot of oil and gas off the California coast and in Alaska that is classified as "undiscovered." This means that in theory, geologists cannot say with a high degree of probability that these resources exist, the size of their formation, or how deep they are. I recommend that the U.S. Department of Interior, not the U.S. Department of Energy, permit some exploration and drilling activities to access these wells in the event that we have to call on them.

Oil import quotas should also be resisted. Why? Because drilling our own domestic resources cuts into our supply. Why not use all the imported oil we can, maintain our domestic resources, and be more prepared for an oil crisis.

Increasing Natural Gas Production. Natural gas production can be increased 56 percent on an annual basis from current levels. We can reduce our imported oil demand by 5 percent with vigorous research and development. For example, there is a large gas field in the Missouri and Illinois area that has a 50-year supply of gas at current demand levels. A Colorado gas field has a 100-year supply. However, drilling costs of these sites are economically prohibitive. Research is currently being done, especially in the area of hydraulic fracturing, to remove gas at an economic cost.

Further, by repealing the 1978 U.S. Fuel Use Act demand can be restricted to prohibit end-users from converting to natural gas when economically infeasible. For example, all electric utility plants built before 1978, cannot use natural gas.

Increasing Wood Usage. Wood represents a fairly large resource in Wisconsin. Currently we use about 14 percent of its annual renewable production levels. Research needs to be done to determine how wood can be more usable within environmental constraints.

We must try to reduce our dependence on imported energy products and increase our reliance on domestic products.

The major point of these recommendations is to try to reduce our dependence on imported energy products and increase our reliance on domestic products. A very small change in international politics can have a very substantial impact on the U.S. economy and more importantly, Wisconsin's economy.

On the demand side, conservation projects can be implemented. The results of conservation are amazing, but further measures must be taken. For example, furnace conversions should be promoted in the residential market. Weatherization or insulation is not enough. The payback period on furnace conversions is only 33 percent of insulation projects' payback period. Incentives to convert furnaces should be given, because the average efficiency of furnaces in Wisconsin is 60 percent. That suggests that 40 percent of the heat is going up the chimney. Current technology in newer furnaces can reduce that inefficiency to 5 percent to significantly reduce residential energy consumption.

Heating efficiency systems should also be promoted at the commercial level. Computerized heating systems that regulate a blower can reduce energy demand by 65 percent with a 2-year payback period. New industrial technology can also be promoted to reduce gas demand. For example, the primary metals industry, which employs 18,000, is using a new furnace that combines electricity and gas. Gas is directed on the source and electricity heats up the remainder of the furnace. This method can reduce energy demand by 30 percent.

These technologies already exist so it is conceivable that we could easily reduce energy demand by 30 percent by the year 2010. We have had a 25 percent conservation rate since 1980 so a 30 percent conservation rate by 2010 is not unrealistic. The bottom line is that assuring supply, and reducing energy resource demand will equal job growth. And job growth comes from reducing energy expenditures. More jobs can be created in Wisconsin by implementing these measures. I project that by 1990, 10,000 new jobs can be created; 30,000 by 2000 and; 50,000 by 2010, by implementing conservation steps.

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Timber Resources and Products: Their Importance to Wisconsin and the Nation

William J. Lange

This paper addresses the importance of the forests products industry to the state of Wisconsin. It provides an overview of Wisconsin's timber resource situation and puts the national situation for timber supply and demand into perspective. Finally, it discusses the opportunities for Wisconsin's forest products industry.

The Importance of the Forest Products Industry in Wisconsin

The forest products industry in Wisconsin employs approximately 70,000 workers, about 16 percent of all manufacturing employment in the state (Wisconsin Department of Natural Resources, 1985.) Significantly, the industry is a leading employer in 24 of the state's 72 counties, and ranks second or third largest in another 13. Thus, in over 51 percent of Wisconsin's counties, the forest products industry is among the top three employers.

> *Wisconsin is the nation's leading papermaking state in terms of production and variety of products, a ranking it has held for several decades.*

Wisconsin is the nation's leading papermaking state in terms of production and variety of products, a ranking it has held for several decades. The state's pulp and paper mills annually produce approximately 3.5 million tons and more than 4.1 million tons of combined paper and paperboard. The paper industry in Wisconsin employs 47,000 men and women earning an annual payroll exceeding $1.25 billion. The multiplier impact of the paper industry's personal income has a $2.8 billion impact on the state's economy, while paper industry employment supports the jobs of another 120,000 non-paper industry workers.

While the paper industry is very important to the state, its importance to the local economies is crucial. Many of the counties in which the forest products industries play a major role are otherwise without substantial or broad commercial industrial basis. They rely heavily on the needs of Wisconsin's pulp and paper mills to maintain a viable local economy, full employment, and opportunity for economic growth.

Due to this preeminence, Wisconsin has become the nation's leading manufacturer of machinery for the pulp and paper industry. Wisconsin currently has 24 active wood pulpmills with a total mill capacity of

4,900 tons of pulp per day. The amount of pulpwood received by these mills is approximately 200 million cubic feet of which approximately 40 percent is imported from other states.

The Timber Resource Situation in the State of Wisconsin

Wisconsin encompasses some 35.9 million acres (Blyth, et. al., 1985). It is the 12th largest of the nation's 25 major timber-producing states. The area includes nearly 14.5 million acres of commercial forests. In comparison to the other major timber-producing states, Wisconsin ranks 17th in total commercial forestland, and 18th in the percentage of commercial forestland to total area.

The forest products industry is a minor landowner in the state. About 8 percent or 1.15 million acres of the commercial forestland of Wisconsin is owned by forest products ventures. In comparison, Wisconsin ranks 18th among other major timber-producing states. Federal, state, and local governmental forestlands, which are managed for the public, comprise 32 percent of the commercial forestland. Private, non-industrial owners account for the vast majority of the commercial resource, some 8.6 million acres, or 60 percent.

On a volume of wood used basis, pulpmills dominate Wisconsin's forest industry (see table below). Over 40 percent of all the roundwood timber produced in the state is consumed by pulp and paper mills. Fuelwood is the second most important use of timber. It accounts for about a third of all timber harvested. Sawlogs, ranked third in terms of importance, accounts for over 20 percent of timber production.

Roundwood Production in Wisconsin, 1981

Roundwood product	Roundwood production, percent
Pulpwood	41.9
Fuelwood	33.9
Saw logs	21.8
Veneer logs	1.1
Posts	1.1
Other	0.2
Total	100.0

Source: Blyth et al., 1985

Timber production in the state of Wisconsin has climbed rapidly from just over 180 million cubic feet in 1967 to nearly 400 million cubic feet in 1981 with most of this harvest in hardwood species. Annual production increases have averaged 6 percent for softwood timber and 5 percent for hardwood timber. Aspen, red oak, and elm were the leading species cut and provided over 50 percent of the total statewide harvest.

Nearly 80 percent of the timber harvest has come from private lands. Public land supplied a higher portion of the softwood than hardwood because most public lands are in northern Wisconsin where softwood are more prevalent.

Growth exceeds harvest for most timber species in Wisconsin, resulting in volume increases for Wisconsin's timber resource.

Growth exceeds harvest for most timber species in Wisconsin, resulting in volume increases for Wisconsin's timber resource. This volume increase provides an opportunity for growth in Wisconsin's forest products industry.

National Outlook for Timber

The U.S. Department of Agriculture (USDA) Forest Service has just completed a major study of the timber situation in the U.S. South (U.S. Department of Agriculture Forest Service, 1986). As a part of conducting that investigation, the USDA Forest Service examined the national situation with respect to timber supply and demand.

The USDA Forest Service projects that there will be very little increase in the production of softwood lumber, veneer, and plywood. The principal increase will come in softwood pulpwood where the USDA Forest Service projects an increase from 3.8 billion cubic feet in 1984 to 4.9 billion cubic feet in the year 2030, an increase of nearly 30 percent.

With respect to hardwood, most of the future increase in timber production will come from pulpwood and fuelwood. In 1984, the USDA Forest Service showed pulpwood production at 1.4 billion cubic feet and fuelwood production at 1.2 billion cubic feet. These numbers are projected to rise to 2.9 billion cubic feet and 1.7 billion cubic feet respectively.

So, at the national level, the USDA Forest Service is projecting significant increases in timber consumption. Those increases are for the most part, concentrated in two timber products: pulpwood and fuelwood. These are two timber products that will figure importantly in Wisconsin's future forest products industry.

Technical Opportunities for Forest Products

Technological developments can substantially improve Wisconsin's employment and income levels through greater utilization of the region's forests.

Technological developments are increasing the potential for Wisconsin's forests to contribute to the state's economy. While other factors will have control over institutional arrangements that modify the ability to realize this potential, technological developments can substantially improve Wisconsin's employment and income levels through greater utilization of the region's forests (State Foresters of the 20 Northeastern States, 1984).

As noted earlier, Wisconsin forests are predominately hardwood forests. Technological developments are increasing hardwood species' usefulness. Some of these developments relate directly to timber products production technology including pulp and paper products and building materials, while others relate to the technology in fields that are major users of timber products.

The development of waferboard and several kinds of structural flakeboard are examples of technology affecting building products. Waferboard and flakeboard provide less expensive substitutes for softwood plywood in many aspects of housing construction. The principal raw material is aspen, which is abundant in the state. These products can be made from small logs, thus further strengthening the market for hardwoods. Other species of comparable physical characteristics are also being used (U.S. Department of Agriculture Forest Service, 1978).

Press drying is an example of new processes that increases the usefulness of dense hardwoods and paper manufacture. This process uses heat and pressure simultaneously to force wood fibers into close contact, forming strong inner fiber bonds that produce stronger sheets of paper. Hardwood and softwoods are interchangeable in this process. However, the process gives the relative advantage to hardwoods, which otherwise are difficult to bond strongly because of their short, stiff fibers. Press drying also appreciably reduces the energy requirements for manufacturing paper by using pressure rather than simply heat to remove water. Press drying has substantial potential in paper production for corrugated boxes and related containers and is expected to become a commercial reality in the near future (Ince, 1981).

Changes in communication technologies are another example of technological developments affecting a major user of timber products. The proliferation of special interests magazines is only one illustration of the expanding use of printing and writing papers. Hardwoods are used in the manufacture of these high quality papers. Newsprint, by contrast, is produced primarily from softwoods. The inroads that specialized cable television may make on newspapers, particularly in terms of advertising, portend a decline in newsprint use. Although coated groundwood and super colander papers that are made from softwood seem to have strong future, the demand for refined paper made from hardwood is expected to increase both relatively and absolutely.

Since the establishment of the Forest Products Laboratory (FPL) in Madison, Wisconsin, many of its wood utilization research programs have had a major favorable impact on Wisconsin's industrial base. The most affected are the manufactured board and sawmilling industries.

Wisconsin's manufactured board industry, consisting of two particleboard plants, three hardwood plants, and a waferboard plant, is an important component of the state's forest-based industries. The FPL has been conducting research on particleboard and waferboard since the late 1950s. This research has provided extensive data that focuses on raw material options, processing alternatives, product performance levels, related economics, and alternative marketing opportunities.

Forest Products Laboratory research has also added to Wisconsin's industrial base with improved sawmilling techniques where several sawmills have specifically improved their lumber yields. More recently, the first full scale demonstration of the "Saw-Dry-Rip" process was performed at Medford, Wisconsin, in cooperation with the University of Wisconsin (UW) Extension and other state and county professionals. This process can make high-grade structural lumber from our plentiful hardwoods (Harpole, 1983).

Future technological developments favor the increased use of Wisconsin's forest resources.

All of these technological developments favor the increased use of Wisconsin's forest resources. This greater utilization translates into expanded employment opportunities and higher income levels for the state.

Conclusion

Wisconsin's forest products industry is important not only to the many communities that depend on it, but to the nation as well. Much of the current timber harvest, as well as the future harvest, will be used to make pulp and paper, and as fuelwood. New technologies will enhance Wisconsin's timber resource utilization, and will add to the forest products industry's employment.

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Environmental Management: A Global Profit Center

Bruce B. Braun

Few dispute that Wisconsin's economic and political history is tied to the development of its natural resources. First it was fur. Later it was timber, minerals, soil, and water. Fate gave Wisconsin, its entrepreneurs, and its farmers, abundant raw materials upon which to build our economy and from which to fund our social institutions. And Wisconsin's people excelled--in commerce, industry, education, and government.

Correcting Resource Abuse and Establishing a Reputation

But there were costs. The overuse or abuse of natural resources brought another kind of attention to Wisconsin. Here, too, other states and nations looked to us, as we achieved overwhelming success. For example:

- We reforested the North woods and developed a sustaining supply of timber for our pulp and paper industry.
- We cleaned and ultimately protected miles of rivers and streams.
- We introduced and managed fish and wildlife species that attract anglers and hunters from throughout the world.

Not content to rest on our laurels, Wisconsin state government, businesses, and the University of Wisconsin (UW) have maintained the state's leadership in environmental management.

Not content to rest on our laurels, Wisconsin state government, businesses, and the University of Wisconsin (UW) have maintained the state's leadership in environmental management by excelling in areas like biotechnology, space technology, automated information systems, pollution control technology, energy management, industrial systems efficiency, and much more.

Changing Economic Climate

When the U.S. was a leader in the global marketplace, Wisconsin was an important world manufacturing center. The state was referred to as the "machine shop of the world." And we prospered. From those profits we built our universities, funded our public institutions, and cleaned our environment. But then the "star of the snowbelt" lost some of its glitter; some individuals began to see environmental protection and long-term resource management as a competitive hindrance.

Indeed, some discarded long-term prudence for short-term profits. We hear of forestry practices driven by a conglomerate's cash flow needs rather than a lumber town's survival. We are told of some states looking the other way in enforcing pollution laws. In short, there is a feeling that protection and wise management of Wisconsin's natural resources are a competitive burden, not an asset; they are a threat, not an opportunity.

At the same time, some worry that the nation and the state are becoming little more than resource colonies, shipping raw materials like trees overseas to turn into finished lumber, cabinets, and furniture.

There is even talk of exporting our region's water. We argue that the industry should return to Wisconsin if it wants our water. But that notion is somewhat unrealistic because new industries are becoming more water conserving and, at least in the near term, we cannot count on profits from water export, certainly Great Lakes water that is managed jointly with Canada.

Natural Resources and the State's Economic Future

How can we find other ways to utilize the natural resources that helped our state grow and prosper?

How can we find other ways to utilize the natural resources that helped our state grow and prosper? Physical resources need not be changed or consumed to achieve some economic good. Simply put, the trees and water can be enjoyed by visitors--paying visitors--simply by being there. People are willing to pay for esthetics. And we are fortunate that management for harvest or utilization often meshes well with management for esthetics.

Another way to benefit our pocketbooks from natural resources is by emphasizing their contribution to our "quality of life." Lifestyles and living conditions are increasingly important determinants in the location of businesses, especially businesses dependent upon highly-educated professionals. Wisconsin can use the high quality of life present in every region of the state to its advantage.

There is another way to benefit from our resource heritage and history. It is unconventional and challenging. If we are successful in developing it, we can forge a head-on attack against some concerns that cause our political and business leaders so much trouble when pondering Wisconsin's future.

I pose these general questions first, questions that get to the basic theme of "The Future of Working Wisconsin" conference: Who will be Wisconsin's workers in the next century? And what will they do?

Will Wisconsin continue to tolerate the brain drain--the education of our best and brightest people for work elsewhere? Or will we create enterprises that allow them to apply their knowledge in an information-driven world?

Will Wisconsin continue to tolerate the brain drain--the education of our best and brightest people for work elsewhere? Or will we create enterprises that allow them to apply their knowledge in an information-driven world?

Will Wisconsin continue to assign its best and brightest citizens to endeavors that are fading in prominence? This is the theory of Marquette University economics professor Douglas E. Booth (Carlson, 1986). Or will we challenge all to become "knowledge entrepreneurs" capable of competing in a global marketplace?

Environmental Management: A Wisconsin Profit Center

I believe Wisconsin can become a national and global profit center for the development and distribution of knowledge, technology, and equipment required by nations and multinationals for proper environmental management and industrial efficiency.

Wisconsin can carve out a "knowledge niche" in the global marketplace--a niche that has the potential to bring revenue from other states and nations to Wisconsin. My proposal is based on several assumptions:

First, Wisconsin and the U.S. will never again dominate the world market in manufactured goods. Similarly, Wisconsin's manufacturing sector will no longer provide as large a share of the state's jobs.

Second, unless Wisconsin focuses on specific marketplace opportunities that meet emerging world needs, it may be destined to do many things poorly.

Third, Wisconsin has sufficient knowledge and experience in environmental management to be respected nationally and globally.

Fourth, America's and Wisconsin's competitive advantage lies more with brainpower than manufacturing muscle, although it makes good sense to mesh the two where there are natural linkages.

Fifth, Wisconsin is on the cutting edge of technology and brainpower, where natural resources are concerned. Biotechnology, environmental epidemiology and toxicology, remote sensing, climate research, hazardous waste management techniques, energy systems analysis and design, recreational needs assessment and management, pollution control methods and public policy developments are just a few examples.

Sixth, Wisconsin, through its university and vocational systems, is also known for its ability to transfer institutional and managerial skills.

Seventh, if properly developed and marketed, it is possible to forge a unique partnership among some unlikely parties, such as:

- Established heavy industries that have developed and applied pollution control technologies and systems;
- New businesses associated with genetic engineering, robotization, remote sensing, and health care;
- State agencies like the Wisconsin Department of Natural Resources (DNR) that have a wealth of information and experience in pollution control, land management, fish and wildlife development, outdoor recreation and forestry, and raw waste reduction;
- The UW system, especially its Institute for Environmental Studies, schools of medicine and engineering, and College of Agricultural and Life Sciences in Madison and campuses throughout the state, especially Milwaukee and Stevens Point; and
- The vocational system with its technical training capabilities.

Demand for Environmental Management Systems and Equipment

Information prepared by the DNR helps substantiate the need and potential for a global profit center in Wisconsin. Examples include:

- A Caribbean nation is concerned about deforestation and wants to fund a regional forestry school. It is looking for a joint-venture opportunity with a state in establishing a forestry partnership: The components would be curricula development, facility design, instruction, and summer field experience.
- Deforestation, is a major global challenge. Reforestation programs requiring skills, equipment, and trees are among the priorities of several emerging nations.
- Bioengineered trees, as part of reforestation or a production system represent a $600 million annual market, which is just the beginning of a large untapped market.
- The World Bank is beginning to promote a sustainable type of development, geared less to blind industrialization. Environmental systems' experts and analysts are needed to help the bank make environmentally-responsible investments.
- Since Bhopal, multinational and transnational corporations need to emphasize environmental safety, not necessarily because the host nation requires it, but because it is good business.
- Industries throughout the world seek ways to improve efficiency that reduce raw materials and energy costs, while reducing waste and pollution.

- Many parts of the world face water shortages, sometimes compounded by deforestation, as trees necessary for watershed management are stripped off hillsides by fuel-poor people. With large water projects falling into disfavor, there is a need for water management equipment and management systems.
- Africa needs scientists and technicians to help develop a sustaining, as opposed to exploitative, agriculture. Experts in disease-resistant crop strains, more efficient cultivation techniques, and natural methods of pest control are in demand. Africa is looking for a green revolution that does not destroy its environment.
- UNESCO needs satellite-generated maps to help areas relocate refugees displaced by drought, deforestation, and politics in southern Africa.
- India needs help in developing an environmental impact process as part of a national housing policy.
- Indonesia needs help setting up a higher education system that could serve the entire region with experts in natural resources management and environmental protection.

Here in the U.S. we have states that we see as competitors in a global marketplace driven by cheap labor and lax regulations. And what do we find? We find states that need conservation policies and effective technologies to allocate water among residential, commercial, and agricultural users. We find the Southern Growth Policies Board (1986) reporting that the South's need for wastewater treatment facilities will be three times as great as outside their region. For them, improving wastewater treatment facilities is good business. The Southern Growth Policies Board (1986) reports:

> Business and community leaders are realizing the long term benefits of maintaining environmental quality. Areas allowing environmental degradation because of inadequate treatment facilities will be less desirable sites for future development.

We find businesses increasingly more concerned over environmental risks, sometimes leading to litigation and social confrontation. There is a need for environmental mitigation services and evaluation of real versus perceived risks. Throughout the nation, we find a market for pollution control equipment totaling $8.5 billion annually according to the U.S. Department of Commerce.

Indeed, a number of Wisconsin firms are already looking at environmental management opportunities. Among these are: Aqua Chem; Rexnord; Badger Meter; Lanair, Inc.; Geotextile Systems, Inc.; Water Pollution Control Corp.; Agracetus; Universal Foods; and Foregen, Inc.

There are knowledge entrepreneurs as well. There is Residuals Management Technology (RMT), a fast growing environmental consulting firm with national clients. At the UW, faculty consultants receive contacts from throughout the world as governments and private businesses seek solutions to environmental problems and the means to manage a sustainable natural resource base.

But I believe we have just scratched the surface of environmental entrepreneurship. We have an impressive list of public and private resources. We have the UW, U.S. Forest Products Laboratory, Institute for Paper Chemistry, National Wildlife Health Laboratory, and more. We have the paper industry, with firms like Consolidated and Wisconsin Tissue that have impressive environmental management and industrial efficiency records that give them enhanced profits while better protecting the environment.

I firmly believe Wisconsin can put itself at the environmental rainbow's end, if it proclaims itself the nation's "environmental management knowledge center."

I cannot quantify the potential profits, but I firmly believe Wisconsin can put itself at the environmental rainbow's end, if it proclaims itself the nation's "environmental management knowledge center." Wisconsin has the potential to be a full-service, one stop center to help customers:

- Prevent environmental degradation;
- Manage existing resources like soil, water, trees, fish, and wildlife;
- Protect human health from environmental contamination; and
- Apply principles of industrial efficiency to help others achieve greater profits, while protecting the environment and saving energy.

If you question that potential, simply watch representatives of various states and nations parade through the DNR and UW. Almost weekly other states and nations inquire about Wisconsin's natural resource management and ways that it may enhance their own situation. We have often wondered what the profits would be if we charged for our advice. Based on just recent advice given by DNR specialists, we would have been paid in Duetsche marks, yen, rubles, francs, rupees, and renmindi, to name a few currencies of nations we have advised.

A Plan for Action

What must we do to capitalize on this potential? Eights points are essential to developing an environmental management knowledge center.

Cooperation is Key. First, as I suggested earlier, business, government, and the UW must work together. We need trust. We need to develop a business plan starting with an environmental knowledge resources' inventory of our strengths and weaknesses. We will need to place those resources in the context of the global market: What do customers need today and what will they need in the future? We need to investigate links that can be made with the International Environmental Bureau in Geneva, the World Environment Center in New York, and the International Environmental Forum, which keeps Canadians and Americans up-to-date on each other's environmental laws.

Easy Access. Second, we must develop a natural resource knowledge and equipment network that allows customers easy access to service providers or goods producers. We must be able to package the hardware and software. Should a nation come to us with a reforestation need, for example, we could respond as a full-service organization: with bioengineered trees, satellite generated resource maps, user-friendly technical assistance, public policy approaches required for sustainable policies, and perhaps even with a financial package involving the World Bank, United Nations, private sector, the U.S. State Department, and U.S. Agency for International Development.

Aggressive Marketing. Third, we must develop a unified and aggressive marketing strategy. This strategy must be built upon the credibility of our past natural resources and pollution control successes and our ability to remain on the cutting edge of environmental technology and management.

Dollar Investment. Fourth, we must invest public and private dollars in focused research, development, and demonstration efforts. An example might be focusing biotechnological research on pollution control, bioengineered trees, protection of genetic diversity, pest-resistant crops that reduce the need for chemical control, or adopting a more holistic approach to environmental management.

Facilitate Learning. Fifth, we must invest in specific courses of instruction and associated support systems for students who want to become proficient as environmental scientists, managers, and technicians. In the past, Wisconsin technicians traveled worldwide to set up and service Wisconsin-built heavy machinery and equipment. Perhaps some day, Wisconsin-based technicians will be better known worldwide for their ability to set up environmental management systems and technology. If this is to happen, there will need to be close coordination among representatives of business; industry; the UW system; the Wisconsin Board of Vocational, Technical, and Adult Education (VTAE); and the DNR.

Encourage Testing. Sixth, we must encourage testing of new techniques and technologies in pollution control, waste reduction and reuse, land and water management, fish and wildlife management, and environmental management institutional arrangements. Wisconsin must become a global environmental classroom and lab. We already have examples: the beneficial use of foundry sands, conversion of wood waste to energy, residuals to heat installations, and waste-heat recovery installations.

Identify Incentives. Seventh, we must develop incentives for environmental management, knowledge-based businesses, and environmentally-related knowledge or equipment development within our existing business and industrial community. At the very least we must identify and address some of the roadblocks to progress.

Challenge Businesses. Eighth, we must challenge Wisconsin businesses to develop or exploit new environmental management product lines, perhaps linked to existing businesses and industries, for example:

- Wisconsin utilities might develop spinoff businesses and product lines based upon their knowledge and experience in facility siting, conservation, alternative fuel uses, and environmental management.
- Wisconsin insurance companies can develop environmental risk assessment and management services as part of their policyholder services.
- Wisconsin manufacturers like Nelson Industries in Stoughton, Wisconsin, which makes exhaust and filtration products, might be encouraged to develop scrubbers and other systems useful in controlling air pollution. Why can't Wisconsin get a large portion of the $7.5 billion air pollution control industry expected to emerge from national acid rain control?
- Wisconsin packagers can continue to develop and promote reusable or biodegradable packaging for publicity-conscious food processes or landfill-short governments.
- Wisconsin educational institutions and the legal community can develop environmental arbitration and mediation services geared to avoiding or resolving natural resource conflicts.

Is Wisconsin Ready for an Environmental Management Knowledge Center?

Is this idea realistic or far fetched? I am sure there are environmental management entrepreneurs elsewhere. Simply look at 3M and its 3P program: "Pollution Prevention Pays." The company's program not only reduces its own environmental costs, but it is becoming a global profit center. Our challenge is to find our niche and excel. The challenge is for Wisconsin government and business to overcome their historical tendency to be adversarial and develop a newer, healthier, symbiotic relationship.

Is Wisconsin ready to think this creatively?

Reflecting on the list of assets, I have one nagging fear, however. And it is this: Is Wisconsin ready to think this creatively? Are we inclined to investigate the potential objectively and take the necessary risks to plunge into this new venture? There are a few glimmers--some Milwaukee area promoters and state marketers have listed pollution control equipment as a readily exportable commodity.

In addition, we should remember that Wisconsin has taken bold, innovative steps before. The nation's first activated sludge, secondary sewage treatment system was installed at Jones Island in the 1920s. Wisconsin industry capitalized on that and continues to make profits from wastewater management and treatment. Firms like Rexnord, Allis Chalmers, Johnson Controls, Autotrol, Neenah Foundry, and Hamilton Industries have made and continue to make profits from pollution control.

As to the future, someone needs to break the ice. So DNR Secretary C.D. Besadny will meet with UW President Kenneth Shaw on this concept. This interest is in keeping with both of the organizations' strategic directions.

The idea of an environmental management knowledge center is not original. The Germans in the Ruhr Valley hope to sell some of their knowledge and equipment on the global market. So we need to know the competition.

The marketplace is a large one, but opportunity faces us. It is a unique opportunity that allows Wisconsin to capitalize on its physical and intellectual assets in order to survive economically and environmentally. A strong economy and a healthy environment go together. Yet if we are to be economically strong, we must broaden our perspective and go beyond the industrial age, linking existing industrial capability with information age needs.

It is a link that can profoundly and dramatically demonstrate for Wisconsin that a sustainable global environment can bring the state a sustainable economic climate--a climate that contributes to everyone's quality of life.

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SUMMARY OF PRESENTATIONS ON ENERGY AND NATURAL RESOURCES

Speakers: Kenneth D. Frederick, Jeffrey P. Brand,
William J. Lange, and Bruce B. Braun

There is mounting concern over natural resource depletion. However, there is little agreement on how to solve the problem because solutions depend on the relative values placed on environmental amenities, the severity of the problem, the costs involved, and the type of approach used.

Agriculture and forestry are the largest users of land and water resources. The problem is not lack of water or land, but land and water use. The main issue regarding agriculture is the rise in real costs, or costs adjusted for inflation. Agricultural costs are both financial and environmental. The financial costs of agriculture are not increasing because the advantages of technological change are offsetting the negative factors occurring from erosion and conversion of prime farm land. By contrast, the environmental costs of agriculture are increasing substantially. Ground water contamination from pesticides and fertilizers is a major cost as living standards depend on availability of good quality water. Because water is treated as a free resource, there are few institutional constraints on water use, such as incentives to preserve and protect water or the reallocation of water supplies from agricultural (low value) use to municipal (high value) use.

Forestry is undergoing a transition. Old stocks are decreasing while second growths and plantation forests are being used more often. The issue is not whether forest stocks are disappearing, but whether the U.S. can be competitive in wood production. It is anticipated that the South will be the most competitive area in the U.S. in wood production. The traditional Great Lakes and Pacific Northwest areas are not expected to remain competitive. The application of technology may change this expectation by augmenting the competitiveness of particular areas. In fact, technological developments are creating opportunities for Wisconsin to use its timber resources more effectively. For instance, they have allowed the creation of wafer board, which unlike plywood, uses hardwood--an abundant Wisconsin timber resource. A saw milling technique developed at the Wisconsin Forest Products Laboratory also favors the utilization of hardwood.

Wafer board technology as well as technology to economically use wood for fuel will further enhance Wisconsin's competitive picture by reducing energy use. This in turn, will improve the employment situation. Wisconsin employment is sensitive to energy prices and is resource vulnerable. Energy expenditures in Wisconsin increased 130 percent between 1975 and 1985, representing a net loss of 175,000 jobs. Technological developments and conversation measures that assure an adequate supply of energy are needed to maintain employment. In addition, business, government, and the university system must work together to protect Wisconsin's resource base. The state should design a natural resource network, develop a unified and aggressive marketing strategy for commercial products, invest in research and development, provide instruction for students who want to specialize as environmental scientist managers, encourage new technology and management techniques, provide incentives for the effective use of natural resources, and challenge business to develop and apply improved environmental management techniques.

CRITICAL ASSUMPTIONS AND ISSUES RELEVANT TO ENERGY AND NATURAL RESOURCES

Assumptions

Fresh water will continue to be an important resource for life.

Fresh water will continue to be an important consideration for industry.

Issues

Since water at the source is considered to have no value at present; and since it costs 10 to 100 times more to clean up water containing waste than to clean up wastes before dispersal into the water, what new technologies or increase in present technologies are needed to clean up hazardous materials/wastes before they are dispersed into the environment?

What programs/courses to deal with technologies and attitudes regarding a clean environment will need to be developed by the VTAE system?

Assumption

Electrical energy produced from nuclear materials will be reduced in the future.

Issues

Since nuclear wastes are becoming more difficult to dispose of; nuclear regulatory provisions are becoming more stringent; and no nuclear plant has been designed since 1980 in the U.S.; what impacts will result from business and industry becoming more dependent upon electricity produced from fossil fuel and hydro-powered units?

What significance will increased electrical energy costs play as they become a larger proportion of district budgets?

Will electrical energy limits due to lack of capacity limit some manufacturing?

Assumption

Manufacturing uses a large amount of energy, and this energy will increase in price.

Issues

Since energy costs, especially oil, will continue to rise causing high-energy-use industries, (paper, foundries, enameling, plastics, etc.) to feel the effect of increased costs first, will the increased cost of manufacturing products cause a competitive disadvantage for Wisconsin manufacturers?

Will there be a need for more emphasis to be placed on conservation of energy in educational programs and education within programs?

Assumptions

There will be an increase in wood used for heating.

There will continue to be an increase in wood available for heating and for products in Wisconsin especially in Fox River Valley.

Issues

Since presently only one-seventh of the annual replaceable wood in Wisconsin is being used, and since timber growth is presently exceeding the harvest in Wisconsin, what new technologies will the system need to develop to use this resource in heating and products?

Will the VTAE system need to develop courses in safe use of wood for heating?

Since timber in Wisconsin is predominately hardwood, and since 60 percent of paper pulp land is privately owned, will the VTAE system need to develop programs to train workers so that wood furniture manufacturing will continue in the state?

ADDITIONAL RESOURCES FOR ENERGY AND NATURAL RESOURCES

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Engineering and Mining Journal

Patricia A. Travis, dean of development and interim director at Nicolet Area Technical College assisted the Research, Planning, and Development Administrators by providing these additional resources.

THE FUTURE OF WORKING
WISCONSIN

Quality and Worker Productivity

The job security of millions of American workers depends on producing quality products. Working people recognize that jobs are secure only if jobs are done well.

Rudolph A. Oswald
AFL-CIO

The Outlook for Work, Productivity, and Labor/Management Relations

Rudolph A. Oswald

Work is the basic way we get our income. It also provides status in society as well as self-fulfillment and satisfaction. Unfortunately, too many Americans do not have the opportunity to hold a job and make a social contribution through regular paid work.

A persistent job shortage afflicts America. The lack of jobs affects young and old; male and female; black, white, and Hispanic; and blue and white collar workers. At the end of 1986 there were more than 8.2 million Americans who were officially unemployed. In addition, there were 1.2 million "discouraged workers" who had given up looking for jobs they could not find and 5.8 million part-time workers who wanted full-time jobs. In all, 15 million Americans suffered from job and income loss. Many of these individuals may never find a job.

Such high levels of unemployment as in Kenosha, Wisconsin are intolerable. They injure and destroy individuals and families and weaken and disrupt society.

In Wisconsin, there are approximately 150,000 workers officially unemployed. However, more than 250,000 workers in this state are suffering unemployment and underemployment. In Kenosha alone, unemployment must be at least 20 percent; a sharp contrast from the official 10 percent. Such high levels of unemployment are intolerable. They injure and destroy individuals and families and weaken and disrupt society.

In 1983 the AFL-CIO Committee on the Evolution of Work declared that 4 to 6 million jobless workers may become a permanent labor-surplus underclass in a polarized two-tier society that could develop under current economic policies. This potential underclass threatens the stability of the nation's economic, social, and political institutions.

The problem is not the individual's lack of will to work. The work ethic is strong. Unemployed workers look for jobs and feel guilty when they cannot find work. The problem is lack of jobs. The mandate of the Humphrey-Hawkins Full Employment and Balanced Economic Growth Act of 1978 has been ignored--in spite of the economic loss of goods and services and in spite of the human suffering, dependency, family breakdowns, crime, and other social problems brought about by high unemployment.

"Full employment is the foundation for a just economy."

The AFL-CIO strongly endorsed a pastoral letter on the economy by the National Conference of Catholic Bishops (1986). The Bishops agreed that "full employment is the foundation for a just economy," and that "the most urgent priority for domestic economic policy is the creation of new jobs with adequate pay and decent working conditions."

The Catholic Bishops' statement on the national economy focused attention on problems faced by unemployed or low-wage workers, farmers, and those unable to work for health or family reasons. The pastoral letter went beyond expressing of concern and set forth an achievable blueprint for the country to move toward full employment and eliminate poverty. Support for child care services for working parents, the need for adequate parental leave policies, and equal employment opportunities for women and minorities were all recommendations that received wholehearted support of workers and unions.

The AFL-CIO was pleased that the Bishops reiterated their support for the "right of workers to form unions," thus affirming a long-standing commitment of church tradition. The AFL-CIO will continue to respond to the Bishops' challenge "to develop a new vision of [workers' and unions'] role in the U.S. economy in the future." The call for economic democracy to match America's political democracy has been the reason for the existence of America's labor movement.

Challenge of Change

Massive structural changes of the American economy are perpetuating high unemployment and related problems. Industries and occupations are changing. Imports threaten jobs and the high-value dollar continues to discourage foreigners from buying U.S. exports. Both of these factors destroy job opportunities for American workers.

Demographic changes are also affecting workforce composition. There will be fewer 16 to 24-year-old workers in 1990 than there were in 1980. The workforce will have more blacks, Hispanics, and females.

As computers and robots assume more functions in the factory and the office, a two-tier workforce will develop.

Technology is displacing workers and overturning traditional work patterns. To meet new technological demands, more education and training will be required for some workers. As computers and robots assume more functions in the factory and the office, a two-tier workforce will develop. Some jobs will be upgraded, but many jobs will be downgraded. In some cases, there will be a narrowing of skill differentials between supervisors and production workers, because both will need detailed knowledge of a relatively complicated process.

The top tier of the workforce will be executives, scientists, engineers, and managers. They will perform high-level, creative, high-paid, full-time jobs in a good work environment. The bottom tier will consist of low-paid workers performing relatively simple, low-skill, routine, high-turnover jobs in a poor work environment. These jobs will often be part time, without job security or opportunities for career advancement. Too often these jobs will be oversupervised and workers will have little or no control over the pace of work.

Between the two workforce tiers will be fewer permanent, well-paid, full-time, skilled, semi-skilled, or craft production and maintenance jobs. In the past, these jobs have offered job security and upward mobility to workers who started in low-pay, entry-level jobs. Many middle management jobs will also be eliminated.

AFL-CIO Jobs Program

Full employment at an acceptable living wage for all working people is a moral, social, political, and economic imperative.

Full employment at an acceptable living wage for all working people is a moral, social, political, and economic imperative. Through the years, the AFL-CIO has advanced a comprehensive set of programs toward economic progress and social justice. These include:

- National economic policies aimed at full employment and job creation based on the Humphrey-Hawkins Full Employment and Balanced Growth Act of 1978;
- Expansion of training and job programs in both the private and public sectors;
- Human resources and productivity development through better education, training, retraining, upgrading, and upward mobility opportunities for all workers, both employed and unemployed;
- Antidiscrimination programs, equal employment opportunities, and affirmative action policies to help blacks, Hispanics, women, and other workers who need these protections;
- Day care for children of working parents;
- Minimizing, cushioning, and humanizing the adverse effects of industrial, occupational, and technological change;

- Realistic trade policy and rational industrial policy to achieve international competitiveness, national security, increased living standards, and job-creating economic progress; and
- Social justice, including full civil rights for all Americans.

The Union Voice

Collective bargaining is the major vehicle and the key process through which workers express interests and concerns in the work place. Thus, labor unions have a key role in our democratic society by giving workers an important collective voice. Union members have an opportunity to promote better wages and working conditions, prevent arbitrary and unfair management actions, and improve the decision making process.

The practice of "industrial democracy" is essential in a free democratic society.

The rights of workers to organize and to bargain collectively with employers are fundamental to the workers' dignity and self-respect on the job. Through their own freely-chosen union, they exercise their right to set wages and improve working conditions. This practice of "industrial democracy" is essential in a free democratic society.

This view of industrial democracy was set forth by two Harvard professors (Freeman & Medoff) in 1984. They (Freeman & Medoff, 1984) pointed out that collective bargaining changes the employment relationship from a casual dating game, where people look elsewhere at the first serious problem, to a more permanent marriage, where they seek to resolve disputes through discussion and negotiations.

The key idea is that unions provide workers with a "voice" in the work place instead of only an "exit" option. Consequently, union workers have a lower turnover rate than nonunion counterparts. This means increased productivity and increased concern for quality, since workers have an interest in long-term success of the enterprise for which they work.

Quality

The job security of millions of American workers depends on producing quality products. Working people recognize that jobs are secure only if jobs are done well. Producing quality products is consistent with the ethics of American workers and their unions. Workers feel satisfaction from producing products that are of high quality. If an employee's self-esteem is related to his or her work, the employee will want that work to be highly regarded. But, few workers have control over decisions about the quality of products they produce. Lack of proper tools and equipment, inadequate maintenance, inadequate time for quality performance--these and many other factors often prevent workers from producing a high quality product. The hierarchical, decision-making structure adopted by most managers is an impediment to improving product quality. It has also been criticized as a structure that frustrates workers who want to contribute ideas or improve work practices so that a job can be done better.

Quality Circles

Recognition of the stultifying effect of the hierarchical management style has led to work place experiments that involve workers in work place decisions. Sometimes called "quality circles," these programs give workers a voice in decisions that affect the work place and the work environment. Ways work is to be performed, the tools used, and production process issues are examples of these decisions.

Productivity is increased when workers feel a sense of work involvement.

Workers would like to cooperate with management, because they want the firms they work for to be strong and viable. Productivity is increased when workers feel a sense of work involvement. They gain a greater sense of dignity when they feel that they are producing useful products of good quality, and that their work is recognized and valued.

The collective bargaining process is an essential foundation of honest labor/management cooperation, because it is the only way to establish a genuine partnership. Collective bargaining is vital in enabling workers to participate meaningfully in such programs. Work place programs and labor/management committees are a supplement to collective bargaining, but they have never been a workable alternative.

Unions and management are adversaries during collective bargaining, because bargaining wages and living standards are part of the process of dividing up the pie. The adversarial process should produce a contract for labor/management cooperation during the life of the agreement. The contract assures that the union is an equal partner participating in the setup, training, and guidance of the new labor management program. Once the contract is signed, labor and management cooperate to ensure success.

Quality circles or other labor/management cooperative programs should not be productivity programs per se, even though management may correctly expect that such productivity improvements will flow from the program. The program sessions should be a forum where workers can discuss issues that are of concern to them as well as to management. Human concerns must be raised along with management's interest in production problems.

The goal of cooperative programs is to foster a better work environment that makes workers more efficient and results in better quality products. Workers who have high morale are more productive and more conscientious. Unions have made an important contribution in raising morale and giving workers a stake in their jobs and the health of the firms for which they work. The trade union's purpose is to raise workers' living standards and improve working conditions. In accomplishing this purpose, unions make a contribution toward greater efficiency and productivity.

Union Productivity

Unionized workers are more productive, because the union enables them to obtain dignity and a greater stake in the jobs they hold, as well as a voice in the decision making process. Several studies comparing productivity in union and nonunion work places supported this statement. They included:

- The most comprehensive comparison of union versus nonunion productivity in the U.S. was done by University of Maryland economist Charles Brown and Harvard economist James Medoff. Their (Brown & Medoff, 1978) study compared union and nonunion plants in 20 manufacturing industries and found that union work places were 22 percent more productive than nonunion plants.
- Kim Clark (1979), an economist at the National Bureau of Economic Research, looked at union and nonunion plants in the cement industry. Clark (1979) found unionized plants 6 to 8 percent more productive than nonunion plants. In plants that had changed from nonunion to union, unionization led to productivity gains ranging from 8 to 10 percent.
- Steven Allen (1979), an economist at the University of North Carolina, compared the productivity of union and nonunion construction workers using nationwide census data and found union workers at least 29 percent more productive than nonunion construction workers.

Researchers identified a number of reasons for increased productivity among union workers. Better pay and benefits provided by unions, greater job security, and an efficient grievance procedure all contributed to increased job satisfaction among workers, therefore making them less likely to quit. Lower turnover of union workers meant that unionized work places had more experienced, better-trained workers on the job. The seniority system helped raise productivity by increasing job security and providing the basis for a better working relationship among workers. Seniority can greatly weaken the feeling of rivalry, making workers willing to share skills and knowledge about their jobs.

The best way to build quality in the work place is to ensure that workers have genuine involvement in their work, through pay setting and determination of employment conditions.

If properly implemented, increased efforts at labor/management cooperation may, in many cases, be successful in increasing productivity and product quality. However, this is not a quick fix or substitute for a realistic assessment of the nation's economic problems. The general economic problems, stemming from high budget deficits with links to high interest rates and an overvalued dollar, need to be corrected. The best way to build quality in the work place is to ensure that workers have genuine involvement in their work, through pay setting and determination of employment conditions. The union's role is to represent the worker in democratic decision making in the work place.

Conflict or Cooperation

Workers want to obtain, through collective bargaining, a proper share of the wealth they produce. They want a larger piece of the pie than the employer would normally provide without the pressures of bargaining. Unions seek a redistribution of the wealth not only of the corporation, but also of the nation. This redistribution essentially implies conflict. However, that conflict does not have to be an ongoing or permanent situation.

Cooperation and advocacy with occasional conflict coexist in most healthy relationships and are necessary to balance the legitimate roles of management and labor interests.

Cooperation and advocacy with occasional conflict coexist in most healthy relationships and are necessary to balance the legitimate roles of management and labor interests. Cooperation must be based on a shared agenda of facts and developed by parties that see each others' interests as legitimate. Otherwise, unhealthy conflict can lead to the destruction of the enterprise or the economy on which management and labor depend.

Historically, the labor movement's struggle for a real voice in the work place has been consistently opposed by employers. In the early days, employers refused to bargain with unions concerning the basic elements of wages, hours, and employment conditions. As a result, unions developed certain rules to be imposed on employers as a standard requirement. Eventually, employers relented and began to bargain with unions concerning these basic elements. In 1935, the National Labor Relations Act established a public policy requiring employers to bargain in good faith with unions on certain mandatory subjects involving wages, hours, and employment conditions. During World War II, concerns of the war effort and related public policy led employers to agree on a cooperative relationship with unions. They wanted to establish not only basic contract terms, but all issues related to the work place, productivity, and other matters.

More than 80 percent of all labor/management contracts contain management rights or provisions that inhibit or limit the ability of workers or unions from contributing their wisdom and experience to the production process. In the eyes of management, this has too often been seen as interfering with management authority. Labor/management cooperation is impeded even more by the fact that the overwhelming majority of firms continue to resist any employees' efforts to organize. Even a firm that is partially organized resists any spreading of the union to unrepresented units. Some employers encourage or instigate decertification petitions. Cooperation is not possible under such conditions, because the employer is threatening the basic right of the union to exist and function.

American labor organizations are not seeking the destruction of American business. On the other hand, one finds a well-financed National Right to Work Committee, the National Association of Manufacturers, and the National Chamber of Commerce all actively engaged in promoting a "union free environment." These organizations are supported by funds from corporate America.

Many employers seek to develop labor/management cooperation schemes without unions by establishing one-sided, labor/management committees. These groups lack bona fide union representation or collective bargaining. Such committees are a mere sham for true cooperative arrangements and are not a substitute for legitimate collective bargaining and representation for workers. These committees remain a mechanism for evading these goals. Unfortunately, because of weak national labor laws, many employers use committees that evade true representation. Only the collective bargaining stature of unions establishes workers as real partners in labor/management committees.

Labor/Management Cooperation

Under the aegis of collective bargaining, a number of legitimate labor/management cooperation programs have been established in the last 10 years. External pressures such as deregulation, corporate mergers, and foreign competition have encouraged cooperation in such areas as productivity and quality improvement, based on worker involvement. Because unions want a voice and a role in legitimate joint labor/management committees, there are many different programs in existence. Each reflects the parties' needs and their inventiveness in developing new approaches.

Joint labor/management programs across the nation have taken many different forms and appeared in different guises.

Joint labor/management programs across the nation have taken many different forms and appeared in different guises including participatory management, employee involvement, shop/floor democracy, consultation schemes, labor/management committees, quality circles, autonomous work groups, quality of work/life teams, and profit-sharing incentive structures. Today, labor jointly participates with management in committees on safety, apprenticeship, plant and company issues, community-wide labor/management, national labor/management, and other joint efforts dealing with matters of mutual interest. Concerns may be as diverse as foreign trade; federal, state, and local government development programs; community philanthropic purposes; revitalization and strengthening of an industry; and community revitalization, as well as issues of the work place.

In many cases, however, the cooperative agenda remains management's agenda. Workers are still frequently expected to embrace management's plan for productivity improvement, but without a voice in reapportioning the gains. Management wants workers involvement in quality control, but generally does not want to give workers a voice in assembly line speed or the size of the line in front of the check-out counter. In too many cases, participation, productivity, and quality improvement are only slogans. Workers are interested in legitimate, negotiated, shared participation with management in decisions that will affect their needs, including job security, productivity, and quality.

Union Guidelines for Joint Committees

A number of unions have attempted to establish guidelines for local unions to use in differentiating between functions of labor/management committees and those of formal collective bargaining. Among the hoped-for results of joint labor/management committees are enhanced productivity and profitability. Realization of these results would provide for sharing gains through some agreed upon formula or through the general collective bargaining process.

Central to both collective bargaining and effective functioning of cooperative committees is information sharing.

Central to both collective bargaining and effective functioning of cooperative committees is information sharing. Corporations must become more open than they traditionally have been in providing detailed cost and production data. Unions generally are not accorded detailed financial data unless the corporation pleads inability to pay in the bargaining process. In order to function effectively, joint committees must share in the long-range planning and technological assessments that are related to the corporation's and the industry's future. Unions need data that gives not only the specific costs related to a department, but shows how these costs fit into the general financial costs and corporation plans.

Most unions seek a prior commitment from management that the program implementation of such joint committees will not result in worker displacement. Workers do not want to participate in a scheme to put themselves out of work. Without some guarantee that their suggestions will not result in loss of jobs, workers are reluctant to make labor-saving suggestions. A contract provision frequently negotiated by unions to safeguard against such changes guarantees the jobs of existing workers or assures that reductions take place in line with normal attrition due to turnover, retirements, and deaths. Adjustment procedures are sometimes negotiated to provide for special early retirement programs. Some contracts also assure income or pay guarantees.

When joint labor/management committees are established, it is best that unions participate from the very beginning.

When joint labor/management committees are established, it is best that unions participate from the very beginning, helping to design the program. Workers should have an equal voice and representation on various steering or planning committees. Similarly, unions should be jointly involved in any orientation and development of a joint program because if they are not, the program will be viewed antagonistically by workers and unions.

In developing the plan for such committees, the role of the union steward and the foreman or forewoman need to be clearly spelled out. Such committees should not be designed to replace either position. Unions are also concerned that programs have the support of both top management and top union officials. Without the commitment from the top of each organization, the effectiveness of joint committees will be severely limited.

Joint committees cannot work without support for the concept and the program from all strata of the management/union structure.

Joint committees cannot work without support for the concept and the program from all strata of the management/union structure. All purported good will of a single departmental committee will not have much impact if it lacks the support of both top management and top union officials.

As a tool to help labor and management meet their basic goals, these labor/management programs can develop skill improvement programs, more flexible work schedules, greater job security, and promotional opportunities. They can lead to greater productivity, improved quality, enhanced profitability, and other management goals. But, if the agenda is fixed on productivity, quality, and profitability alone, worker interest falls off. To the extent that there is an honest shared agenda, workers and unions will support these projects with enthusiasm and take pride in the improved productivity and product quality.

Workers on Corporate Boards

Many proponents of labor/management committees do not include worker ownership or worker membership on the board of directors as part of their consideration. This country's trade union movement has not taken an official position on this question, although individual unions have sought, and sometimes obtained, such participation. Worker owners, labor representation on a corporation's board of directors, workers as stock owners, workers as total owners through employee stock ownership plans, and working with corporate management to disarm takeovers by other corporations are some of the mechanisms that have caught the public's attention in recent years.

In the 1980s, American unions negotiated for one or more seats on the boards of directors of a number of firms that were in financial distress and were, therefore, seeking concessions from the unions. The first notable example was the seat on the Chrysler board given to Douglas Fraser and now held by Owen Bieber, his successor as president of the United Auto Workers (UAW). One-fourth of the directors for both Eastern Airlines and Western Airlines are held by members of various unions that represent pilots, machinists, flight attendants, and other personnel. Membership on the boards of directors was not a philosophical goal of these unions, but a practical mechanism for unions to help resolve issues that contributed to the financial straits of those firms and to protect the interests of workers whose concessions relieved the financial stress.

Conclusion

Experience with various forms of labor/management cooperation shows that successful relations can be achieved when there is a sharing of basic goals and an acceptance of the respective roles of each of the parties.

Experience with various forms of labor/management cooperation shows that successful relations can be achieved when there is a sharing of basic goals and an acceptance of the respective roles of each of the parties. There is no basic philosophical attack by the labor movement on the role of management or private enterprise in American society. However, unions feel management does not always recognize the legitimacy of labor's role.

Where there is good will, there will continue to be joint labor/management approaches at the national, local, and plant levels. Concerned parties will cooperatively devise solutions to problems that affect them and may, in some cases, agree to disagree. Joint labor/management activities will not displace collective bargaining as the major means of setting the groundwork for industrial relations' solutions. However, such approaches will grow in importance as supplements to the contract negotiation tradition.

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Quality Management: A Process for the Future

Robert L. Esten

This paper is about quality. Not the conventional quality that is seen in quality control or quality assurance laboratories or that has historically been practiced by design engineers and problem-solving teams. It encompasses a *quality improvement process* that involves all employees within an organization.

The acronym, *DIRT FT*, is increasingly recognized in discussions about quality. It means, "Do it right the first time." It has been called an exhortation to quality improvement, not a system, not something you can get your hands around.

Another commonly used acronym is *DIRE*. It stands for, "Do it right eventually," which is the unfortunate and costly alternative to not doing it right the first time. Many workers and managers have been in "dire" straits with regard to quality and how to manage it.

There is a quality improvement process that allows us to get our hands around quality management. I am pleased to say that it is being implemented at Akrosil.

Quality At Akrosil

Quality improvement can be implemented in any organization, large or small.

Quality improvement can be implemented in any organization, large or small. I represent Akrosil, a division of Thilmany Pulp and Paper Company in Kaukauna, Wisconsin, a producer of lightweight specialty kraft paper and specialty converted paper products.

Thilmany Pulp and Paper Company represents the industrial papers division of Hammermill Paper Company, which is predominantly a producer of fine writing papers and xerographic copy papers.

Akrosil makes one specific kind of speciality product, silicone-coated paper. Called release liner, this specialty paper is used in conjunction with pressure sensitive labels and tapes, nonwovens, and feminine care products. The little strip that is peeled from a nametag is an example. This product is sold in the Far East: Singapore, Japan, Taiwan, and South Korea, and also in Europe: West Germany, the Netherlands, France, and the United Kingdom.

The Quality Improvement Process

The quality improvement process is really that--a process.

The quality improvement process is really that--a process. I emphasize the word process and avoid the word program, because programs have beginnings and endings. Quality improvement must be an on-going process, maturing as it goes. Akrosil has been in this process for 4 years and has just begun to scratch the surface of opportunity and see dramatic results.

The phrase, *quality improvement process*, is altered by some companies. However, phrases like: *total quality management, total quality awareness*, and *quality management process*, all mean the same thing--an effort put forth by an entire organization to manage and improve all processes in that organization.

Quality improvement's importance cannot be stressed enough. Akrosil's quality improvement process has helped the company maintain its international position as a key supplier. Its five top U.S. customers and many foreign customers have formal quality improvement processes. In a recent visit with a European customer, a person had to leave our meeting to attend his quality improvement team meeting. His team meeting was certainly more important than our visit in terms of his company's quality improvement.

The quality improvement process at Akrosil is based on Philip Crosby's (1980) principles. Other quality disciples were examined but his approach was chosen because it provides a better framework in which to create improvement in each and every job or process.

Determine what you need or what is to be done, educate the people involved in the task, then implement.

Determination, education, and implementation have been called a *quality vaccine* by Crosby (1984). Determine what you need or what is to be done, educate the people involved in the task, then implement. If one step is not done before the other, it will lead to disaster. Thinking back, anything we do in normal life is best done when this building strategy is followed. It was this approach that helped Akrosil understand the role of education in building a quality improvement process.

In 1982 and 1983, attempting to determine a proper approach to quality management, Akrosil looked at several alternatives. Consultants were hired to help solve our complex problems. They provided only short-term fixes. Akrosil looked at the quality management models of Deming (1982), Juran (1979), and Crosby (1980).

Quality management and improvement is everyone's responsibility.

At the risk of misstating these other models' roots or definitions, I will summarize them briefly. Juran's (1979) basis is project-by-project problem solving. Both Deming (1982) and Crosby (1980) have a 14-step management process, but Deming's (1982) basis is statistical process control. While Deming (1982) intends for companies to become better statistical thinkers in all phases of their operation, it seems most managers focus on the manufacturing process and miss the opportunity to improve the inputs to that process. Crosby (1980) has a framework for involving everyone in looking at their own role in quality. His model was chosen because of that issue. Quality is not the responsibility of the person on the floor. It is not the total responsibility of the quality control department. It is not the responsibility of manufacturing alone. Quality management and improvement is everyone's responsibility.

Akrosil was shown this model by one of its major customers, who suggested that the company implement a quality improvement process and help demonstrate its benefits. Crosby's model was adopted after seeing it in action and determining that it would fit Akrosil.

The next step in the *quality vaccine* is education. One of the educational courses within Crosby's model has been taught to all Akrosil Employees. It is the Quality Education System (QES). Twenty to 25 people meet for ten 2-hour sessions. There are workshops and break-out teams in the class, which covers such areas as:

- The four absolutes of quality management;
- Problem elimination;
- Teamwork;
- The manager's role and responsibility;
- The company's role in quality; and
- The supplier's role.

Crosby's four absolutes of quality management are building blocks in the management process. They are:

- Definition: *conformance to requirements*
- System: *prevention*
- Performance standard: *zero defects*
- Measurement: *cost of quality*

Conformance to Requirements. Conformance to requirements is the definition of quality. Not goodness, or truth, or beauty but simply conformance that can be measured against the customer's expectations.

Prevention. There must be a system of prevention. It is always cheaper to do it right the first time. The alternative is to make an item, inspect it, and then make it over or fix it if it does not meet requirements. Control the process and learn to generate conforming output--output that people expected to receive when they originally purchased a product or service.

Zero Defects. The third absolute is the performance standard. Zero defects is the first principle that Crosby developed. It has often been misunderstood by the people to whom it has been applied and abused and misused by the people trying to apply it. Zero defects is nothing more than an attitude about quality. It asks how often customers want suppliers to conform to requirements. Zero defects says we need to take all requirements seriously.

If employees are given a performance standard greater than zero, quality will be lost because it is impossible to manage any standard that allows a level of defects.

If employees are given a performance standard greater than zero, quality will be lost because it is impossible to manage any standard that allows a level of defects. "Who will make the error(s)?" becomes the confusing question. If we aim for 100 percent conformance, then our improvement is not limited by our goal. Fifty percent yields jump to 75 percent rather than creep toward a goal of 55 percent.

Cost of Quality. The last absolute is a measurement of the price we pay for not doing something right the first time. In the manufacturing sector, the cost of quality (COQ) is usually measured at around 20 to 30 percent of revenue. Some companies' COQ measures as high as 50 percent. That means they are making two items for every one they ship. The price of nonconformance or PONC, is a great tool to demonstrate to management the need for quality improvement.

Quality is Becoming Popular

Tom Peters (1982), who wrote In Search of Excellence, speaks of a 3-division company categorized by quality and price of goods. The first group produced lower-quality and lower-priced goods. Their return on sales was zero and, in some cases they had a loss. The second group made goods of equal quality to the competition's for a fair and equal price. Their return was 1 percent on sales. The third group had higher prices, but delivered products that conformed more often to their customers' expectations. This group made a 12 percent return on sales. This only reinforces the idea that people recognize and want quality.

Akrosil has also found this to be true. Several customers with quality improvement processes have turned to the company as a sole supplier. They do not really need to divide their business among suppliers since one can meet all their needs. Deming (1982) strongly advises companies that the effort required to manage one supplier properly cannot be spread to three or four effectively.

Improved Attitude Toward Quality

Prevention. It is our thinking process that is at work here, not a measurable process. A zero defect company cannot be measured by its products; it can only be measured by its attitude, systems, policies, and style. There is no guarantee that the last product produced predicts the next product's quality. Quality cannot be produced through inspection because this method is destructive, costly, and imprecise. Quality must come out of a controlled process and a system of defect prevention.

It is not people who fail, it is the process that fails, and the process has all kinds of inputs.

Akrosil is developing a positive attitude toward the quality improvement process. Defining, controlling, and understanding the process are important first steps. Afterall, it is not people who fail, it is the process that fails, and the process has all kinds of inputs. There are performance standards, procedures, equipment, training, and raw materials that all contribute to customer satisfaction. Success in defining these requirements with customers, leads to success in process design that generates the expected output. But for all of this to happen, everyone must take their role in the process seriously.

The employee is the expert. He or she is absorbed in the production process every day. All employees, including managers, have inputs and internal customers such as fellow employees. One way to enhance internal customers' satisfaction is to enhance information sharing between employees. Let them tell each other the things they need to be successful in their own job. Suddenly people will be more cooperative and polite to each other--all with the goal of improving their ability to do their job right the first time.

But there is also a struggle, because some employees do not always succeed in giving others the things they promised. People do not change long established habits easily or quickly. Frustration builds until employees remember that quality improvement is a process. Zero defects will not be achieved instantly. This is a never ending effort at improvement.

The quality improvement process itself, is a 14-step process that is formally managed. The most important step in the process is management commitment. Top managers must be committed to the process, or it will fail. It requires resources and participation from the president or chief executive officer (CEO), because he or she is a worker in a process with inputs and customers. More importantly, the top manager sets the tone for the quality improvement process throughout the organization.

Future Quality

There will be fewer suppliers in the future. These suppliers will be stronger and able to provide a wider range of services. We will simply not need as many of the same suppliers competing for the same pie. We will have the same number of people providing services, but not the same organizations, repeating services. Repeating services is a costly thing to manage. Three paper suppliers are not necessary when one could do the job. Besides, it's expensive! For good management, a company should find one or two good suppliers and work with them very closely. Share information with them. Open up the process to them. And build mutual trust. There will be mutual benefit as the customer and supplier help each other improve and grow.

Quality is an issue of survival. The Japanese focus on meeting all requirements all the time through a system of prevention while the U.S. is still trying to find the defects before they are shipped.

Quality is an issue of survival. The Japanese focus on meeting all requirements all the time through a system of prevention while the U.S. is still trying to find the defects before they are shipped. Eventually, manufacturers want to be good enough not to produce defects so they do not have to be so good at finding them. We will achieve our goal but with fewer, more intense, suppliers.

I also think that the day will come when suppliers begin to choose their customers more selectively. This new quality improvement process depends on conformance to requirements. These requirements must be negotiated and agreed upon, not imposed. Customers and producers must jointly develop these requirements. If businesses continue to have customers that cannot give them feedback, they will begin to shift those people out of their customer base.

The new culture, or environment, that results from quality improvement cannot be overemphasized. Employees sharing information and believing in each other, everything being done right the first time, less stress, enhanced self-esteem, and greater reward, are only a few benefits of a positive environment of quality improvement. But those benefits will only be realized to the extent that management continues to be committed to a new style of quality management and takes seriously its own role as a full and willing participant in a process that succeeds best when the entire organization joins in and commits to a philosophy of defect prevention.

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The Changing Nature of Work, the Work Place, Managerial Behaviors and Implications for Wisconsin's Economy

Robert L. Witte

What will work be like in the next two decades, and how will changes in the work place impact on both the quality of life and the economy of Wisconsin?

Some trends are clear; some facts are known. The fact that smokestack industries are changing but not dying is good news for the industrial sector of Wisconsin. The fact that Wisconsin scores high on most quality of life indicators suggests a bright future for the state. The aging of the baby boom generation bodes well for the middle class and its spending power. The fact that there are more jobs and more people working, even though they are working in lower paying, service sector jobs, suggests that the state's economy is basically sound and that it should remain so at least through this century.

This paper will discuss two major changes in the work place and the role of education in helping leaders, workers, and managers learn skills that will help keep businesses competitive. This paper assumes four important ideas:

- The world of work and the work place is changing rapidly.
- These changes will result in a higher quality of work life for many.
- These changes will require adjustments on the part of both labor and management at every level of the economic system.
- Continuous and intense periods of learning will be required by everyone except those with a minimal level job. Thus, the demand for an open educational system will increase, forcing new ways of thinking from school boards, faculties, and higher education administrators. The role of education as a state resource will be better utilized. Leaders will gradually realize that lack of knowledge and understanding is a greater danger to the U.S. than foreign competition or labor management polarities. The unknown factors are impacting negatively on leading, planning, and managing organizations. In a fast changing world, ignorance is not bliss, because all too often competitive forces do not allow second chances.

Work Place Reform

In the 1970s corporations were attacked for their unresponsiveness to the needs, values, and abilities of the changing workforce. The workforce had changed in composition. There were more skilled workers, but also more females and minorities. Workers were older, better educated, more career-minded, more rights conscious, more concerned with meaningful work, and had higher expectations (Kanter, 1977).

These workforce changes pointed to a growing mismatch between workforce characteristics and the ability of the work place to satisfy the new expectations.

These workforce changes pointed to a growing mismatch between workforce characteristics and the ability of the work place to satisfy the new expectations. Berg (1970), a labor economist, argued that the payoff from education had declined because of a growing scarcity of "desirable" jobs. Too many jobs were too narrow to use the skills and capacity of the workforce.

In her book, Bardwick (1986) argues forcibly that there have been two decades of decreasing promotion opportunities. Promotion has been one of the corporation's major sources of increases in pay, challenge, and influence. Decreasing promotional opportunities is the result of increased competition from a larger number of baby boom aspirants, an aging workforce, postponed retirements, and a slower growth economy. These forces prevented the organizational pyramid from expanding to accommodate those seeking the "better jobs." In these ways the "old work place" was seen as inhospitable to the new workforce.

In response, changes began to occur. The United Auto Workers and General Motors embarked on a "Quality of Work Life Program." The literature about these changes revealed a gradual increase in work place reform through the 1970s and into the 1980s. Several work place characteristics appeared to be increasing, such as:

- Employee involvement programs that include quality circles, problem-solving teams, and worker and labor representatives on management boards (Chrysler);
- "Matrix" organizational restructuring to reduce layers of hierarchy and provide more autonomy and responsibility without promotion (General Electric);
- Organizational transformations, or restructuring to reduce layers of pyramidal hierarchy that allows for job enrichment and closer contact with decision makers, without requiring promotion;

- Programs that stimulate entrepreneurship, such as internal venture funds that encourage new product or new service ideas. The 3-M company used this approach and developed new product lines and divisions, increased sales, and additional growth opportunities for employees. (Peters & Waterman, 1982); and
- Flex time, part-time, job sharing, and work-at-home arrangements that allow people to exercise more choice over hours worked in order to accommodate nonwork interests or responsibilities.

These attempts to solve work place problems created new dilemmas. Kanter (1986), a Harvard management professor, cited three new problems that stem from these practices:

- The impact of greater employee participation on the legitimacy of pay systems has raised questions about the payroll division.
- The impact of the desire for innovation and risk taking, and the sharing of ideas on the legitimacy of management controls.
- Equal opportunity for women and the increasing absorption of work has increased tension in the work place.

Work place reform in the U.S. is real. Wisconsin companies are following national trends in this regard. The transition of the work place requires in some cases, an increase in spending. However, if productivity is to result and conflict is to be minimized, each reform requires a re-education of managers and labor leaders who learned their skills in the pre-1970s work place. Few companies in Wisconsin are strong enough in their own markets to survive without adapting to these changes and the resultant increases in human productivity.

Changes and Trends in Management

There have been very few noticeable changes in the way corporation managers have functioned in the past 100 years.

Managerial attitude and behavior in the work place is very difficult to change. There have been very few noticeable changes in the way corporation managers have functioned in the past 100 years. McCormack (1977), suggested that only a few changes resulted because managerial science as it is taught in business schools is not practical to the real problems faced by today's businesses. Another possible explanation may simply be that any system that encourages conformity tends to precipitate itself, even in the face of information and reason. Regardless of the cause, there are several, discernible, significant, and observable trends in management behavior that will impact on work and work organization in Wisconsin in the coming decades. These include:

- Rewarding employees with salary increases based on company profits.
- Continued severe competition in the marketplace.
- Reducing the number of middle management levels in organizations.
- Utilizing new technology at every level of organizational life.
- Nonwork factors that may affect work performance are increasing.
- Requiring managers to receive ongoing work related education.
- Managers must communicate, negotiate, and enlist cooperation.

Rewarding Employees with Salary Increases Based on Company Profits. This has long been the practice in Japan, where as much as one-third of an employee's wages may be based on bonuses that are related to company profits. Most American companies are engaging in downsizing or transformation activities. The literature contains regular articles describing changes within ranks of corporate middle managers. Corporations for the most part, seem highly committed to raising productivity through better financial management, creative use of technology, and improving productivity.

Continued Severe Competition in the Marketplace. Few companies today control their markets to any noticeable degree. Wisconsin companies in particular, have had to face fierce competition from domestic and international markets. Competition may have the positive impact of forcing management and the workforce to do a more effective job. Competition involving price and quality will force companies to find specialized market segments, control costs, and sharpen management tools.

Reducing the Number of Middle Management Levels in Organizations. As middle managerial jobs are eliminated from organizations, more part-time employees and consultants are used for their jobs. More subcontracting of work occurs and many jobs are pushed down the organizational ladder to lower level management and hourly employee positions. This in turn, has resulted in a greater need for better-trained, lower level managers.

The use of microcomputers is almost a requirement for every managerial job.

Utilizing New Technology at Every Level of Organizational Life. More managers are using new technological applications than ever before. They are under constant pressure to do this. The use of microcomputers is almost a requirement for every managerial job.

Nonwork Factors that may affect Work Performance are Increasing. Increased investment in employee benefit programs, smoking restrictions in the work place, and increased use of company drug and alcohol testing are examples of this trend. As organizations require more from people and the capital investment per employee increases, this trend is expected to continue.

Requiring Managers to Receive Ongoing Work Related Education. Several companies require as much as 5 full days per year for each manager. Honeywell evaluates managers' educational needs and graphs their educational shortcomings. Managers at Honeywell are responsible for demonstrating improvements in their competence levels.

Managers must Communicate, Negotiate, and Enlist Cooperation. The ability to see fellow employees at every level as team players and participants in the organization's ongoing success is a necessity.

These trends in management cause fretting and resistance on the part of some managers. Some trends might change under shifts in economic conditions; however, all of them could become an integral part of management in organizations in the coming decade.

Challenges for Management's Future

Never before has the nation's business community been faced with as much change as is now being demanded. New technology, new management systems, new and different organizational patterns, shifts in jobs to service sector lower paying positions, and a rapid market sector restructuring are only some of the larger dimensions of change that are currently taking place.

A major asset of Wisconsin's business community is its highly-skilled, educated workforce. Wisconsin has a system of secondary education that helps high school students score in the nation's top 10 percent on college entrance tests. The vocational and technical schools are well located and provide some of the best skill training for young people and adults found in the world. The University of Wisconsin (UW) system is accessible so that almost any student with the ability and desire can earn a college degree close to home. Even though the educational systems have been criticized because of their cost to taxpayers, they have provided an important resource that can increase Wisconsin's economic position.

The coming decade will require knowledge intensity at a level never before imaginable.

New jobs and new companies are largely the result of the innovative process. The innovative process is knowledge intensive and relies on human intelligence, knowledge, and creativity. New experiences are accumulated at a fast pace: The learning curve is steep. Entrepreneurial managers are unique in the way they apply knowledge.

Innovation occurs from a knowledge base. Galbraith and Kazanijian (1986) asserted that implementing a manufacturing innovation requires both the creation of knowledge and the integration of current knowledge from the manufacturing organization. The coming decade will require knowledge intensity at a level never before imaginable. Highly-technical companies and companies that rely heavily on research and development activities are acutely aware of this.

Breckenfeld (1987) described 23 metropolitan areas, where job growth is likely to be highest in the 1990s. Leading the list was Boston and the surrounding areas, because of the heavy concentration of higher education institutions and their ability to generate the knowledge necessary for the future of business and education. Wisconsin businesses and managers must learn to create closer ties to system campuses. Campuses must regard themselves as having both the knowledge needed by organizations and skills that can assist companies in their service areas.

Continuous and lifelong learning is a necessity for business.

Continuous and lifelong learning is a necessity for business. Those companies and managers that have discovered ways to integrate new knowledge and information into operational plans will have a tremendous advantage in the evolving work place. The old axiom that said we must learn to "work smarter not harder" has never been more true than it is today and will continue to be in the future.

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SUMMARY OF PRESENTATIONS ON QUALITY AND WORKER PRODUCTIVITY

Speakers: Rudolph A. Oswald, Robert L. Esten,
and Robert L. Witte

There are approximately 150,000 unemployed persons in Wisconsin, but unemployment affects another 250,000 people. These levels of unemployment are high by historic standards and tend to undermine society. Unemployment problems must be resolved because people want to work, but cannot find jobs.

The massive U.S. trade deficit as well as national monetary and fiscal policy have contributed to unemployment growth. The national deficit must be reduced to slow employment declines. In addition, a commitment to jobs and to quality in those jobs must be made by all parties involved. Workers must realize their contribution to business and be able to provide input into its success. They must become a part of the quality improvement process. To implement quality improvement, it is essential to look at how quality is controlled.

There are four essential principles of quality: First, *conformance to requirements*, which is the definition of quality; second, *prevention*, which is the system used for quality; third, a *zero defects system*, which is the performance standard of quality; and fourth, *cost equality*, which is how finances are managed in the organization. A company should not be measured solely by its products, but also by its attitudes and style. One hundred percent quality should be expected even if it cannot be achieved, and the work process should be controlled. It is not the worker that fails, but the process, because workers are a part of the process. To effect quality, a company must find out both what it needs as well as how to accommodate those needs.

One of the reasons some people are hesitant to establish quality processes is because they require a cultural transition. Cooperative effort is needed to assemble the knowledge to make the process work. This cooperation requires a reorganization of corporate thinking and presents challenges for both labor and management.

The country and the state must make changes to create jobs and encourage economic growth. Although the nature of work is changing, a job must provide for growth and development of individuals because workers' attitudes are changing as well--they increasingly want job security and satisfaction. In order to improve worker performance and satisfaction, employers must be prepared to pay for what a worker knows as well as what he or she does.

The use of quality circles and other quality processes will require a greater commitment by all parties than in the past to accomplish the goals of quality, worker satisfaction, and productivity. Learning is essential to these goals and labor, management, government, and education must strive together for their accomplishment and the country's economic development.

CRITICAL ASSUMPTIONS AND ISSUES RELEVANT TO QUALITY & WORKER PRODUCTIVITY

Assumption

The largest number of workers since World War II will be in need of training and retraining by the year 2000.

Issues

What new strategies should be explored by the VTAE system to ensure that the principles of quality and productivity that are incorporated into curricula, programs, and instruction to respond to the changing technological requirements in the work place?

Should minimum standards be established by the state or individual districts for VTAE graduates?

How will the VTAE system meet the education and training needs of the private sector in terms of worker productivity and quality and the competitive American thrust with its emphasis on training and retraining?

How can the VTAE system provide specialized materials and instruction for special needs population to ensure their access to training in quality and productivity?

How can the VTAE system instill in students the principles of quality and productivity given workers' needs for job security and satisfaction?

Assumption

The expanding international economy necessitates increased productivity and quality by America's workforce.

Issues

How can the VTAE system work with organizations in developing and implementing worker and quality control concepts in today's competitive global economy?

To what extent should the VTAE system be using international learning materials and developing international programming to enhance worker productivity?

ADDITIONAL RESOURCES FOR QUALITY AND WORKER PRODUCTIVITY

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THE FUTURE OF WORKING
WISCONSIN

Opportunities for Working Wisconsin

> *There is no lack of opportunity when I look to the future for working in Wisconsin. But unfortunately, there are many competitors. Wisconsin must turn around its educational system and industries and get them to be "early adaptors" to change. Only then can the state set its plans and achieve its goals.*

Earl C. Joseph
Anticipatory Sciences Incorporated

The Governor's Address on The Future of Working Wisconsin

This text was edited from a speech made by Governor Tommy Thompson at "The Future of Working Wisconsin" conference.

I want to compliment all of you for attending this conference. The very fact that all of us are here today is a strong indication that Wisconsin has turned the corner and is becoming a better state for education and economic development. The Yankelovich study said that Wisconsin's two greatest advantages in attracting jobs were: 1) our skilled workers, and 2) our great educational system. But as we all know, it's a very competitive world--one with a global economy.

We must compete not only with the Midwestern states, but with the high tech states, the sunbelt states, and yes, the far Eastern countries. Therefore, we cannot rest on our laurels. We need to constantly improve. This conference is public testimony that we are committed to that improvement. I think we should all be very proud of that. I know I am very proud to be Governor of Wisconsin, and even though it is hard work, it is still the best job in the state. It provides the opportunity to lead, develop, persuade, and make things happen. But to be governor of a state where so many different groups of people cooperate and work together, is very much public testimony to our motto: "Forward."

We all know that without quality education we cannot be competitive.

Fifteen different offices, associations, agencies, and government departments worked together to make this conference possible and every person in this state will benefit from it. We all know that without quality education we cannot be competitive. We cannot compete with other states or other countries in attracting new businesses and expanding our current businesses. That is why education at every level is very important.

Education is the most important benefit that state governments can give people to help them improve themselves. It provides that "elevator of opportunity" for every handicapped person, every minority, every poor person, and every individual in the state to better themselves to become meaningful, to have a job, and to grow. I remember 20 years ago when the U.S. Congress was holding hearings on the War on Poverty. After several hours of testimony, one congressman asked, "Why are there not more articulate spokespersons for the poor?" The witness replied, "Listen Congressman, if we were *articulate* we would not be poor." There's a lot of truth to that statement. When people have good basic communication and computation skills, they can usually get a decent job.

I believe that much more than basic skills are needed to succeed in today's world.

However, 20 years after the War on Poverty, I believe that much more than basic skills are needed to succeed in today's world. This is where vocational education comes into play. In addition to basic skills, people need training in special skills and also in ways of transferring their talents to real-life jobs. That is why our high schools, our vocational schools, our adult programs, and our university courses must not only reinforce the basics, but must have the vision to go beyond them.

The people of Wisconsin are very fortunate to have so many dedicated teachers and educational leaders throughout the state; many of them like you, who work hard for everyone's benefit. You take the time to know each student, identify their weaknesses, and develop ways to turn those weaknesses into strengths. You zero in on specific needs. You help students learn to solve problems on their own so that they can act independently. You take the extra time to work with students who need the help and you always do more than required. Those are the reasons we have such an outstanding and excellent educational system in Wisconsin.

Wisconsin does not have a lot of money for education, like some other states. We do not have the fanciest buildings, the most expensive textbooks, or all the audiovisual and video gadgets that other schools might have. But what we do have are leaders like you--people who are dedicated and hard working in a state that is committed to giving its citizens the necessary resources to do a job. The people and the state working together help make Wisconsin's excellent educational system.

Last year our Vocational, Technical, and Adult Education (VTAE) system served nearly 58,000 full-time equivalent students. Over 22,000 people received customized and "quick start" training from the state's vocational schools. We offered over 1,100 different degrees, diplomas, and certificate programs. The ultimate end result of all this effort has been, and will continue to be in the future, more jobs, better jobs, more opportunities, and more prosperity for the people of Wisconsin. That is, if we build on the partnership that has already started and continue to work together.

Education frees people to choose between jobs and select those that are most rewarding in terms of money, growth, and self-satisfaction.

Education is so powerful because it gives people the freedom we all cherish. Education frees people to choose between jobs and select those that are most rewarding in terms of money, growth, and self-satisfaction. Education, and the jobs resulting from it, also give people the economic freedom to provide for themselves and their families beyond the subsistence level that exists in most of the rest of the world.

The challenges that we face in education and economic development today are great. The young students who enter kindergarten this year will graduate from high school in the year 2000. We have the almost impossible task of preparing them for jobs that do not even exist yet. I think we can meet those challenges through cooperation and hard work. We can meet the challenge of technological change. We can meet the challenge of demographic shifts in our population. We can even meet the challenge of foreign competition in the marketplace with rejuvenated companies that have a dynamic workforce.

There is another challenge, too, that I hope to have a hand in causing during the next four years. While attending "The Future of Working Wisconsin" conference you heard demographic predictions on the number of new jobs that there will be in Wisconsin in future years. While you were hearing those statistics and figures here in Wisconsin, I was meeting with Secretary Brock of the U.S. Department of Labor. Mr. Brock told the Governor's Association in Washington that 8 out of 10 jobs by 1990 will require some type of vocational training; that by 1992 there will not be enough qualified workers to meet marketplace needs; and that the states leading this expansion will be those that already have in place, the vision, the infrastructure, the education, and the working partnership between education, business, labor, and government. I am optimistic because I know that our economic development actions in the next 4 years will bust wide open the predictions we have seen about Wisconsin. We are moving because we have a solid base to build upon. Here are some of the things that we can do and that I am trying to do to make Wisconsin more prosperous than ever before:

- We are revitalizing the Department of Development.
- We are coordinating economic development internationally, nationally, and in the state.
- We are coordinating public and private joint efforts such as "Forward Wisconsin."

- We are creating a jobs actions network so companies that have problems can contact state government and get help from vocational schools, universities, and other state departments.
- We are moving the state into international trade.
- We are going to broaden our base and make Wisconsin the most competitive state in the country.
- We are creating a more positive business climate. That is why I am fighting so hard to retain the 60 percent capital gains exemption--so that Wisconsin can be a leader in encouraging entrepreneurial development.
- We are reducing the income taxes. Inheritance taxes will be phased out so that people that have made something of themselves will stay in Wisconsin and the money can be loaned out and used for further economic development.
- We are boosting tourism production and promotion. We want Wisconsin to be competitive. We want people all over this country to know that Wisconsin is a great place to live, work, and play so that they will build their second home and bring their businesses here.
- That means we are going to sell Wisconsin. We are going to be moving into areas that we have not advertised in before--Des Moines, St. Louis, Indianapolis--to target specific groups to come to Wisconsin.
- We are improving our infrastructure on our roads and highways.

All of these things improve our quality of life. The end result of these efforts is how successful we will be. So far we have been successful. General Motors has decided to bring a truck line into Janesville. That was a partnership of business, labor, education, and government working together to develop the best package possible. This effort was testimony to the fact that Wisconsin can compete. We competed against 12 other cities and 3 foreign countries and you know something, Wisconsin won. We have the best package and that is because we work together to develop it.

I have had some philosophical problems deciding whether or not state government should loan money to American Motors to the tune of $195 million. Joe Cappy called me on December 24th, the day before Christmas, and said, "Governor, we would like to expand in Wisconsin. Would you be willing to listen?" And I said, "Of course. This office will always be open for anybody that has an idea to improve the quality of life and broaden the economic base." He said, "Could

I fly over on the 26th of December and talk to you?" I agreed and he came to Wisconsin. During our meeting he asked what I would be offering to give him or give the company.

Do we give money to a corporation and allow that company to stay in Wisconsin?

Here's the problem facing us in Wisconsin, American Motors, and new government: Do we give money to a corporation and allow that company to stay in Wisconsin? I decided, looking at the facts and figures, that it was the right thing to do. I still believe it is the right thing to do even though we have not been able to fully get the deal together yet--it seems to be coming together. And I'm still very optimistic about it.

The situation facing us in Wisconsin by American Motors was this. We have 3,500 employees at the present time. By 1989 that will be reduced to 1,500 employees and there will be no automobile manufacturing from American Motors in Wisconsin. That means, increased welfare; increased unemployment compensation from the rest of the employers; extra taxes from all of us to maintain our quality of life; and for the southeastern quadrant of Wisconsin, it also means a reduction in the standard of living for many people. That was the down side.

The up side was that if we came together to put together a deal with Chrysler and with Locals 72 and 75, and if the state could be come up with the $195 million to loan American Motors, we would not have 3,500 jobs--we would have 8,000 automobile manufacturing jobs and we would have an *additional* 8,000 new jobs created. Those 16,000 jobs would bring in over $40 million a year in increased income taxes alone for the state of Wisconsin, and they would improve the quality of life for all of us.

I think the decision that I had to make was a correct one. Yes, it is a gamble but you don't make gain without some pain, and in this area I think the gain will pay a thousand times over benefits for all of the people.

We also understand that we must work with smaller companies because 80 percent of the new jobs that will be created in the 1990s will be created by employers who now currently employ less than 100 employees. We need to follow the example of Kenneth Hendricks, president of A.B.C. Supply in Beloit, Wisconsin, who in 1979 had two employees. Today he has 600 employees. America's fastest growing business is in Beloit, Wisconsin.

In order to improve the state's economic climate we have to run state government like a business.

In order to improve the state's economic climate we have to run state government like a business. We have to make sure that we set long-range goals. We have to have long-term financial planning that uses annual budgets instead of biennial budgets. We have to make sure that we work together to accomplish these strategic goals. We have to create more jobs. We have to make state government more efficient. We have to increase and enhance the quality of life.

These are the goals of this governor and of this administration and I think they are the goals that all of us must embrace. I have asked every department secretary to make these goals their own. We are going to mobilize resources. We have recruited excellent people to run state government and we have proposed a budget for a list of changes that are going to accomplish these goals. We have to realize, however, that we have a finite amount of resources and we must make some changes in order to keep spending under control, because this budget is tight.

In regard to vocational education, we want to make sure that we increase the opportunity to obtain job skills that allow the people of Wisconsin to have meaningful jobs.

In regard to vocational education, we want to make sure that we increase the opportunity to obtain job skills that allow the people of Wisconsin to have meaningful jobs. In Washington, D.C., this past weekend, everyone was talking about welfare reform. I was the only governor that voted against the governors' position in Washington, D.C. People wondered why a governor from a state like Wisconsin with a progressive tradition, voted against welfare reform. The truth of the matter was that Wisconsin is light years ahead of every other state. Every other state governor was asking for an additional $4 1/2 billion to fund welfare reform. The state of Wisconsin cannot afford to wait. Yesterday Secretary Cullen and I met with U.S Secretary of Health and Human Services, Otis Bowen, and asked for six waivers to develop the most far-reaching, visionary welfare reform program in the country. Wisconsin is going to be a leader.

We are facing a situation where we have the second lowest dropout rate in the nation. In the Milwaukee school system, over 50 percent of the incoming freshmen do not graduate. More than 40 percent of our young teenage girls in the Milwaukee school system become pregnant, and that shows that we have to develop a program for all people. We are instituting a welfare reform program that will become a model for the country. What we are going to do is allow and require young mothers to continue with their education, whether it be in grade school, high school, or vocational school. Day care services for their children will be set up so mothers can stay in school. We are also going to require them to take parenting classes, and if they graduate, we are going to set up a program so they can go on to a vocational school or the University of Wisconsin tuition-free. Career assistance will be provided so these individuals can get a job. Everyone on AFDC will be required to sign up for some type of educational program or retraining.

Vocational education is one of the facets that can make the quality of life better for all students and for all people in the state.

Vocational education will play an important role in this program. The state will pay for these young mothers' tuition, books, travel time, and day care services because, if given the opportunity to have an education, these individuals can get a job and become meaningful members of society. Secretary Bowen has indicated that Wisconsin's program is the most far-reaching--and that if we are able to develop it, it would give those individuals the "elevator of opportunity" to get off welfare and become meaningful members of society. That's why vocational education is one of the facets that can make the quality of life better for all students and for all people in the state. We need to do more work in order to allow people the opportunities you and I have had.

I am also going to be announcing today, and I wanted to take this opportunity to do so, that we are going to set up a blue ribbon task force to look at vocational education--how to fund it, how to come up with the necessary dollars to give you the resources you need to do your jobs. Carl Weigell has agreed to become the chairman of that blue ribbon task force and we will be appointing nine members representing labor, education, and business. There task will be to look at vocational education as it is today and to find ways to make it better in 1990 and beyond. We need your help. We need your suggestions for the appointments. We need the opportunity to be able to come up with the resources to fund vocational education.

I invite you to join me in even greater cooperation and partnership to build Wisconsin.

One of the great advantages about campaigning all over Wisconsin last year was learning about the people of this great state. I thought that in 20 years in the legislature I learned almost everything about Wisconsin, but I was wrong. The thousands of people I met really inspired me. They made me feel that we can solve any problem thrown at us because the people of Wisconsin have a great amount of common sense. The people of Wisconsin are pragmatic. The people of Wisconsin are straight-shooters. The people of Wisconsin are more interested in solving problems than fixing blame. And the people of Wisconsin, when challenged, respond and become even stronger. That is why I am so optimistic about our future and I invite you to join me in even greater cooperation and partnership to build Wisconsin. With your help and your continued hard work, we can accomplish every goal and make Wisconsin the greatest state in the Union.

Opportunities for Working Wisconsin

This text was edited from a presentation made by Earl C. Joseph at "The Future of Working Wisconsin" conference.

Surely there is a future and thine hope will not be cut off.
Proverbs 23:18

In this text, I want to give you some hope for the future and for education. But in doing so, I will not be able to avoid mentioning some of the things that are wrong with education--because they offer opportunities to do better. I want to leave you with some ideas of what we need from education and particularly vocational education, as we look deeper into the future. A school has been defined as "a building surrounded by reality." Perhaps we can bring some of that reality into the school through vocational education.

The Global Picture

We are in the information age. We have been in this age since the late 1950s and have had a long enough time to decide what it is all about. The primary job for over 70 percent of the population is to collect, process, and disseminate information. That means the primary skill required is the cognitive skill. As yet, students in vocational education are not required to take a course that develops their cognitive skills--including the most important one called "thinking". Education defines critical thinking as a problem-solution approach to answer the question, "What is wrong?" However, this question first requires an analytical approach before problem solving can take place.

It is time to switch the paradigm in education and teach students how to do things right the first time.

As futurists, we look at the other side of the coin. We say that problem solution is required, but there is something else also required. It is the learned ability to create and design opportunities--and vocational schools can teach this important skill of "opportunity generation." This holistic approach to putting things together will make a difference. Change requires knowledge and intuition about design and synthesis. I claim that the synthesis process is what we really need in vocational education for the future. We have taught people to do their jobs and then ask, "What is wrong?" As a result, few people are creating anything new. It is time to switch the paradigm in education and teach students how to do things right the first time.

This is imperative for the future where change will accelerate. We are speeding up knowledge production and the application of new knowledge, therefore, we are speeding up change. But the rest of the world is catching up. In order to maintain a prominent position in the world economy, several skills are needed such as:

- Innovativeness;
- Initiativeness;
- Computer competence; and
- Cooperation.

Innovativeness. Innovation is the economic driving force behind our high tech information age. Between World War II and the 1970s the U.S. produced about 75 percent of the world's innovations. We are now down to about 33 percent. We have not lost our ability to innovate, in fact it is growing, but other nations, since World War II have expanded their universities and other research institutions. Since the U.S. represents only about 5 percent of the total world population, it is a surprise that we still produce the lion's share of the world's innovations.

Japan and other countries are not trying to hide their innovations from us. We are hiding them from ourselves.

Japan and other countries are not trying to hide their innovations from us. *We are hiding them from ourselves.* Since the rest of the world is producing a larger share of innovations and students in other countries are required to take English as a second language, the technology transfer process works for them and it doesn't work for us. World labor costs are less than ours because we have a higher quality of life and living standard. When we produce a product, we must charge higher prices for it on the world market, because our inputs are more costly. If U.S. products are to be competitive, they must be better and less costly. Therefore, we must learn to increase our productivity and efficiency at a faster rate so that our products can become lower cost and thus, competitive in the global market. We all know this, but we have not learned it for this new age where the U.S. is no longer the leader. We have an opportunity to create jobs in Wisconsin and make a better Vocational, Technical, and Adult Education (VTAE) system if we teach students how to raise productivity and become more efficient. This involves students learning how to innovate.

Initiativeness. In businesses and schools I have found most people waiting to be told what to do. Few are taking the initiative, because they have not been taught how. Initiative and thinking skills are necessary to working in a global economy. Until these skills are improved, Wisconsin and the nation will not be working in the global economy to their full potential.

The situation however, is not all bad. The U.S. has the best system for encouraging new ideas. In fact, the 1980s will go down in history as the decade of the entrepreneur. The problem comes though, in getting institutions to change fast enough to make use of those new ideas.

United States schools do not integrate computers appropriately into student learning.

Computer Competence. There are more computers in use than there are people in this country. But they are not used wisely. United States schools do not integrate computers appropriately into student learning; Japanese schools are starting to do a better job of this. Yet, we wonder why the U.S. is losing jobs and ground when we do not use the tools of the modern global economy.

Cooperation. Cooperation is key. Trends from other countries show their production and efficiency levels to be ahead of our country's because of cooperation. This could signify doomsday for Wisconsin's traditional businesses areas like agriculture. But trends can be changed. It requires cooperation between government, industry, labor, and education. We must teach cooperation like the Japanese do, in order to be competitive.

Vocational Education's Challenge

Businesses are spending more on training programs than public education does -- yet we need to do more!

Vocational education has a significant role in providing workers for our society in the short-run. But it also has a role in making students aware that they must return to the system to be "recareered." People are just not continuing to learn on their own. Businesses are spending more on training programs than public education does. This tells me that the educational system has not chosen to meet modern society's needs or businesses' needs.

This is education's opportunity for growth. Expert systems are being combined to form a general purpose knowledge base. In the future many professional jobs will be deskilled. This will give vocational education the opportunity to train students for professional level jobs that traditionally required a college degree.

There is no lack of opportunity when I look to the future for working in Wisconsin. But unfortunately, there are many competitors. Wisconsin must turn around its educational system and industries and get them to be "early adaptors" to change. Only then can the state set its plans and achieve its goals.

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THE FUTURE OF WORKING
WISCONSIN

The Future of Education and Training: Trends and Challenges

> *We are either prepared to provide __all__ students the opportunity to participate in the economic mainstream, or we are not. We are either prepared to match the needs of real life with the educational needs of students, or we are not. We are either prepared to provide __all__ our students with the opportunity to share in the good life and to become independent and thinking citizens in this great land, or we are not. We will either help students develop the competencies to function as independent and producing citizens, or we will pay the bills for not doing so later. We will invest in developing human resources now, or we will waste these precious resources and thereby diminish the capacity of individual lives and the strength and vitality of our nation.*

Dale Parnell
American Association of
Community and Junior Colleges

The High School/Technical College Connection

Dale Parnell

The roots of the community/technical college grow deep in the secondary schools, yet in many instances, the communication between and among these two segments of education is sparse and limited.

Community, technical, and junior colleges can be proud of their open-door label. They have opened the door of opportunity for millions of Americans. Higher education will never be the same because of these open doors. And the doors must remain open.

The open-admissions policy has given some high school students an unintended negative signal. As a result, students have perceived the open-door policy to mean that they can prepare as they please and still succeed in a technical college program. This, however, is not the case.

Have community, technical, and junior colleges failed to give high school students and their parents clear signals on the requirements of an adequate high school program of career preparation, as well as university-parallel programs? What will the high school student need in order to receive an associate degree from a technical college program? Do open-door colleges have a responsibility to inform high school students of the exit requirements for technical college programs?

Students Deserve to Know Requirements

High school students, parents, faculty, and counselors deserve to know about:

- Community/technical program exit standards;
- Associate degree requirements;
- Study requirements; and
- Rigors involved in completing technical college programs.

The reluctance of some community, technical, and junior college leaders to be directive in communications with high school colleagues is an entirely honorable reluctance. They have not wanted to be overbearing or tell another educational segment how to run its business. But they should know that most high school administrators have no such fear. Indeed, high school leaders are looking to higher education for information about preparation requirements that will help students succeed. The student must be placed at the center of concern.

The Neglected Majority. The American Association of Community and Junior Colleges (AACJC) believes in the high school/technical collegeconnection. Recently, the association published a book (American Association of Community and Junior Colleges, 1985) on The Neglected Majority, which addressed the middle 50 percent of any high school student body. The AACJC felt that in most education reform reports, these middle quartiles had been overlooked. Let me quickly add that the baccalaureate degree-bound student must also be a concern for any cooperative program between high schools and community, technical, and junior colleges. Programs for these students may take the form of advanced placement, early registration, dual enrollments, or other approaches to academic honors programs. Programs for the academically talented are more important today than ever before. However, other students also need quality education.

Schoolhouse potluck, where students have no focused program, only a hodge-podge of courses, is no longer sufficient.

I can summarize the education reform reports with two words: substance and structure. These reports call for more *substance* in American education, particularly at the high school level, and more *structure* in the school program. Most reports want more program substance, like a math-base, science-base, and literacy-base for all students. Community and technical colleges want more program structure. Schoolhouse potluck, where students have no focused program, only a hodge-podge of courses, is no longer sufficient.

Many suggestions have been made for closing the communication gaps in education. The following factors have greatly influenced my thinking. Most of the information came from the National Center for Educational Statistics (NCES) and a follow-up of recent high school graduates sponsored by NCES (Peng, Fetters, & Kolstad, 1983).

Eleven Million High School Noncompleters. The most startling statistic in all of the literature was that of the 40 million students in U.S. elementary and secondary schools, 11 million will not complete high school. The high school dropout rate has increased 1 percent per year over the last 5 years. Only about three-fourths of those who start high school actually graduate, constituting a 27 percent dropout rate.

Many of these students will come to community/technical colleges within 5 years after they drop out. They suddenly realize that they are not prepared to do much of anything. Community/technical colleges are called upon to rescue these students.

In an information age where technology is increasingly pervasive, do we have the luxury of continuing down this path? Technology is pervasive in our society, and it has great breadth and width. A person can no longer be an auto technician and only change oil. He or she must also know about science and electronics and have good basic and communication skills.

Education's importance is becoming more apparent as students leave schools with no skills to compete in today's job market.

Education is Important. Education's importance is becoming more apparent as students leave schools with no skills to compete in today's job market. This is emphasized by the following points:

- Of entering freshmen in all of higher education, 55 percent now begin their college careers in community, technical, or junior colleges (The College Entrance Examination Board, 1986).
- Of the current adult population, 83 percent do not have baccalaureate degrees (U.S. Department of Commerce, Census Bureau, 1983).
- As reported by 1980 high school graduates in the national longitudinal study (Peng, Fetters, & Kolstad, 1983): 37 percent were academic (college prep program of study); 19 percent were vocational; 42 percent were general; and 2 percent were unreported.
- Nearly two-thirds of the high school dropouts come from the general education program.
- The Southern Regional Education Board (Galambos, 1984) reported that less than 1 percent of the high school students in vocational programs are involved in technical education programs.
- The American Electronics Association (1983) reported that the electronics industry will need 60 percent more technicians by 1987 than were employed in 1983. That means 115,000 new electronic technician jobs will be needed by 1987, in addition to other worker replacements.
- The 20 fastest growing occupations from 1982 to 1995 all prefer postsecondary education and training, e.g., computer science, office machine service, and engineering technicians (U.S. Department of Labor, Bureau of Labor Statistics, 1984b).
- Future private-sector employment growth will be in companies with fewer than 50 employees (U.S. Department of Labor, Bureau of Labor Statistics, 1984a).
- The associate degree is becoming the preferred degree for entry into many technician occupations.
- American private-sector business and industry spend an estimated $30 billion per year on education and training of 11 million employees (National Alliance of Business, 1986).

- A Penn State University study (Kelly, 1983) indicated that 90 percent of entering college students in 1982 and 1983 expected a "B" average in college. Sixty-one percent estimated that they would study fewer than 20 hours per week.
- The same Penn State University study (Kelly, 1983) found that 80 percent of entering college students said they knew little or nothing about their choice of major.
- All those who will be in the workforce by the year 2000 are alive today (Brock, 1986).

During my years as a high school principal, I developed the perception that the senior year for far too many students was a waste of time. Too many students entered their senior year needing only a few required courses for graduation. Oftentimes, these students lacked basic skills but did not use the senior year for their development.

Several of my colleagues feel that it is the community/technical college that should provide these skills to students through 3-year associate degrees. They say this because the quality of some students coming to these colleges is so low that covering all of the information for an associate degree cannot be done in 2 years. In programs like robotics technology, laser technology, or even some of the more traditional technical education programs such as diesel and aircraft technology and associate degree nursing, it is no longer possible to complete a quality program in 2 years. I respond to my colleagues with this concern by saying, "Let's do better than that!"

Putting "turf" arguments aside, technical college educators can work with high school colleagues on the students' behalf.

The 2+2 Program. I am advocating a 4-year program to make better use of the junior and senior year in high school, along with grades 13 and 14. Putting "turf" arguments aside, technical college educators can work with high school colleagues on the students' behalf. These two groups can agree upon a coordinated curricular program that would begin in grade 11, and continue through the associate degree. It would be a program with more structure and substance.

Substance in education does not mean requiring more of a particular advanced subject.

The Effect of Education Reform Movements. Substance in education does not mean requiring more of a particular advanced subject. I sincerely believe that we may be creating a 1990s crisis if we follow *all* of the current reform reports' recommendations. The reports' authors are well-meaning individuals who have experienced the baccalaureate and graduate degree programs. They think the world looks and acts like them, when in fact, the majority of Americans do not.

The 1980 census revealed that only 17 percent of the American population 25 years-of-age and over have a baccalaureate degree. That means that 83 percent of the adult population *do not* have a baccalaureate degree. Let's be optimistic and assume that the 1990 census will reveal a dramatic leap, and 25 percent of the adult population holds baccalaureate degrees. There will still be 75 percent or three out of four Americans who will not have a baccalaureate in 1990. We must ask the question, "How can we assure the 75 percent of the American population, that does not have a baccalaureate degree, excellence in education?"

Can we make winners out of ordinary students? The reform reports did not talk much about the ordinary high school student. In too many cases the reports seemed to indicate that more advanced English, theoretical physics, math, and science courses are the answer. The nonbaccalaureate degree students need more of these subjects, but not in the advanced theoretical sense. They need applied physics, applied math, communication skills, some humanities, as well as solid technical education.

One of the great values of vocational/technical education is that it helps students apply their knowledge in real life.

Education must develop a greater degree of connectedness--connecting real life with the classroom. One of the great values of vocational/technical education is that it helps students apply their knowledge in real life. That does not mean that students should not have more humanities or liberal arts: I am a supporter of these programs. But they must be integrated into a curriculum to achieve clear program goals rather than taken smorgasbord style.

Unfocused learning is, I feel, the enemy of excellence in American education. Through my contact with students, I have found unfocused learning to be all too common. Students take courses without knowing their connection to each other, to the real world, or to the next step in learning.

The Tech-Prep/Associate Degree Program. I agree with the reform reports' general emphasis that more structure and substance is needed in high school and college programs. In response, the AACJC developed the tech-prep/associate degree program. The program would begin in 11th grade and continue with clear targets through the associate degree. The associate degree would most likely be the associate in applied science degree, but an associate in science or arts might be possible.

The tech-prep/associate degree program could be as flexible as educators desire. It could be a general education program at the secondary level and a technical education program at the community or technical college level. The reverse could also be true depending upon facilities and instructor backgrounds. I realize that all schools are different, but diversity could be a strength for these community-based institutions.

Challenging Next Steps

The AACJC is calling for thousands of roundtable discussions between high school leaders and community/technical college leaders to determine how these issues can be resolved. Whether it be the tech-prep/associate degree program, concentration on the middle 50 percent, or emphasis upon advanced placement, the dialogue between these groups must be opened.

There are many quality programs in Wisconsin's technical colleges and high schools. However, in a recent AACJC (1986) survey it was found that on a nationwide basis, little curricular coordination is taking place. Sharing facilities, advance placement options, and students leaving high school to take classes at the community/ technical college, highlight the coordination. But, few governing boards and leaders of community/technical colleges and high schools are jointly developing policies that require curriculum coordination so that students experience continuity in learning.

Too little attention has been paid to the loss of continuity in learning from level to level.

Continuity in Learning is Essential. Excellence in education at any level is further hindered by students experiencing noncontinuity in learning, particularly in the skill-acquiring processes. Too little attention has been paid to the loss of continuity in learning from level to level. I am amazed that some young people learn as much as they do with as much school as they miss. So many students lose continuity because of illness, or because they have lost all interest in school. Unfortunately, we are guilty of allowing a continuity gap to exist between the high school and the technical college. For some students, moving from the high school to college is like climbing Mt. Everest when it ought to be a gentle grade crossing. It is the responsibility of educators to assure the smallest loss of continuity in learning as possible.

Communicate Exit Requirements. Community/technical colleges must give clear signals to high school students, parents, and faculty about the requirements for success in a technical college. I wonder how many high school counselors recommend to their high school students that they consider the associate degree? How many highschool counselors and faculty really know anything about the associate degree?

I do not blame high school personnel for not knowing the answers to these questions. I blame those of us in community and technical colleges. Too often unclear signals about exit requirements from technical college programs are given. In fact, I wonder if we have given an unintended, negative signal to high school students by the term "open-door college." I have been proud of that term because access is essential to community/technical colleges in higher education. But some high school students, parents, and faculty, have interpreted that to mean that the high school program does not matter because the community/technical colleges will always accept a student.

Open-door colleges must give better information to high school students and their parents about what it takes to exit a community/technical college program.

Now, I have no intention of closing the open door or reducing my personal efforts and the efforts of AACJC in increasing access. However, open-door colleges must give better information to high school students and their parents about what it takes to *exit* a community/technical college program--not what it takes to enter a program.

The country's community/technical colleges must communicate with eighth graders about appropriate high school preparation. These students should know associate degree requirements, whether it be an associate of arts, science, or applied science. Colleges have never been reluctant to tell high school students about the college prep/baccalaureate degree track requirements. Four-year colleges and universities have made it clear that without certain high school courses, students will not succeed or not be admitted to college. The community/technical college must also give these clear signals about prerequisite requirements for technical education success.

New Vocational Education. I am not certain of the baccalaureate degree, 4-year college program history. But, I understand that it was developed in Virginia's early days when land barons concluded that 4 years was all they could support for their sons who attended William and Mary College. Whether this was the case or not is uncertain, but why not offer a new 4-year technical education program closely coordinated with high schools? I refer to this approach as a new kind of vocational education--a much broader vocational education.

We do a young, 16-year-old, high school student tremendous disservice by providing narrow, specific job training at the high school level. That narrows people when we ought to be opening the world up to them. We ought to be helping young people develop broad competencies that deal with modern life, not a life that was, but a life that is to come. That will mean a much broader technical education. Unfortunately, we have built too many walls between the practical, liberal, and fine arts, when a well-rounded person needs experiences in all three. Future technicians will need a broader education, rather than a more narrow one.

Naisbitt (1982) said that this country's occupational history is summarized in three words: *farmer*, *laborer*, and *clerk*. These three words will also reveal much about the country's economic history. Naisbitt (1982) speculated about the next word, and I will too. I think the next word will be *technician*.

Naisbitt (1982) said we are living in the time of the parenthesis, the time of in-between. I think we are just in-between the *clerk*, where the predominance of people work in white collar clerical-type occupations, and the gray collar technician. The Washington, D.C., area has already passed that mark, since technicians form the largest single segment of the workforce. Other locations will make the change as well.

There will be tremendous competition for high school students of the future.

Increasing Competition for Students. There will be tremendous competition for high school students of the future. The military estimates (Watkins, 1986) that it must recruit one out of eight high school male graduates to maintain quotas. That ratio will increase to one out of three by 1995. If the military comes close to that target, competition for high school students will be severe. Four-year colleges, universities, and employers will intensify the situation. With the shrinking pool of 17 to 21-year-olds, competition will be keen. Interestingly, there is not that much competition for students in the middle 50 percent of a high school class.

Education faces a tremendous challenge today, but the ideas that I have described will help everyone succeed, regardless of level. High school and community/technical college cooperation can only enhance education for all.

The high school/technical college connection has an opportunity to develop a better education system. This system will be one that helps high schools develop an enhanced learning atmosphere; develops a continuous and focused, coordinated curriculum; provides more structure and substance in the educational program; popularizes the associate degree program; and in many cases helps individuals proceed to the baccalaureate degree. No one loses with this proposition.

The Seven C Evaluation. Educators must continuously evaluate their programs to insure quality. The following template to figuratively lay over educational programs integrates the concepts that I discussed and assists in future planning.

1. Center our concern on the needs of *all* students, rather than just some students.
2. Continuity in learning is an educator's responsibility. Educators must be concerned about the past as well as the future.
3. Clear signals must be given about community/technical college exit requirements.
4. Connect the practical arts with the needs of real life, liberal arts, and fine arts.
5. Completion of a program is important for the student. Earning a certificate or degree can be a quality assurance program for employers or universities.
6. Congruence and coherence are important concepts in program coordination. There must be congruence between words and actions of education, and between programs and real life needs.
7. Competence is the bedrock of all the education effort. Programs must help students develop demonstrated knowledge and skills, and competence must be tested and recognized.

The Future is in our Hands

As a political scientist as well as an educator, I understand the often conflicting demands made upon our schools and colleges. There is a great deal of pleading for one special interest or another. Yet, my paper was written on behalf of the student--our most important national resource.

We are either totally committed to providing quality education for all students, or we are not.

We are either prepared to provide *all* students the opportunity to participate in the economic mainstream, or we are not. We are either prepared to match the needs of real life with the educational needs of students, or we are not. We are either prepared to provide *all* our students with the opportunity to share in the good life and to become independent and thinking citizens in this great land, or we are not. We will either help students develop the competencies to function as independent and producing citizens, or we will pay the bills for not doing so later. We will invest in developing human resources now, or we will waste these precious resources and thereby diminish the capacity of individual lives and the strength and vitality of our nation.

I am confident that Wisconsin leaders have accepted the challenge and seized the moment. We choose hope over hopelessness, opportunity over oppression, and wisdom over waste of human resources.

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Human Resource Development: Serving the New Corporation

This text was edited from a presentation made by Terry K. Broomfield at "The Future of Working Wisconsin" conference.

We are shifting from an industrial economy to a service, technological, and information economy. Accompanying this shift is the emergence of the new, more competitive, and more efficient corporation--one that is much tighter and leaner than in the past.

The key to business success is more output with less resources.

A 1986 study by The Conference Board found that downsizing is not just a fad for today, but that it will continue into the future. Since new corporations are more dependent upon a highly-trained workforce, the key to business success is more output with less resources. That, in a word, is productivity.

Productivity is based on people and machinery. In the past, more attention was paid to machine capital than human capital. But recently, the trend has reversed. Human Resource Development (HRD) is partially responsible for this new emphasis.

There is no absolute definition of HRD. It is a field that may someday be a profession, but as yet, has no specific body of knowledge. Even with these uncertainties, HRD is receiving more attention, because it is playing a major role in serving and enhancing the "new corporation."

A Place for Human Resource Development in the New Corporation

As a result, HRD is coming of age. More companies are using training and development than ever before to enhance productivity and competition. A Fortune Magazine study asked Fortune 500 chief executive officers (CEOs) to list the major issues that they had to deal with. The first two were, as expected, cost containment and productivity. Surprisingly, the third was employee motivation. Finally CEOs are realizing the importance of understanding and working with the employee who gets the job done.

Now HRD practitioners have an unique opportunity to make an economic contribution. The American Society for Training and Development (ASTD) has urged HRD personnel to continue learning more about the field itself *and* the workings of their own companies. That is something that has not been stressed in the past, but must be in the future.

Factors Responsible for Human Resource Development

The economic report card of the 1960s showed that period as having a healthy economy. Government focused on disadvantaged and dislocated workers through training programs. In the 1970s the picture changed dramatically. Rising unemployment and inflation, coupled with reduced productivity and balance of payments spurred the interest in human resource development.

International competition and the need for greater individual productivity focused even more attention on the human factor in the 1980s. Much of this was due to publicity about Japan's increased productivity and a thrust toward enhancing U.S. productivity. In the 1980s many people read books such as In Search of Excellence (Peters & Waterman, 1982). This book captured the attention of American business. It was read by employees, as well as managers. Because of it, employees have internally pushed for changes and more involvement in business decisions. Experts have told them that they should, so now they are taking that recommendation seriously.

Human Resource Development Growth

Growth in HRD has been due to three major factors:

- Politicians have emphasized trained labor's importance in stimulating economic recovery.
- Changing technology has created a need to train highly-skilled workers.
- Development of many new industries has led to the need for retraining for new occupations.

Retraining is an essential component of productivity; one that is given a lot of lip service, but one that is not high on the priority list of many businesses. Opinion Research Corporation (ORC) studied 500 upper and middle managers and asked them to rate the job business is doing (Morgan & Schiemann, 1984). The lowest rated was retraining. There is concern by managers who acknowledge that retraining is essential, but who are not committing their resources to it, as yet.

Human resource development also has implications for economic growth. Since new capital equipment is not being purchased as much as it was in the past, corporations have begun to focus on increased workforce efficiency to maintain or increase profits and competitiveness. Human resource developers feel that workforce learning will be the major factor contributing to gross national product (GNP) growth from 1980 to 1990.

Human Resource Development and Training Expenditures

Approximately $453 billion is spent on formal and informal education and training.

Formal and Informal Education and Training Expenditures

Source	Expenditure
Elementary/secondary	$144 billion
Postsecondary	94 billion
Informal job training	180 billion
Formal job training	30 billion
Government training	5 billion
Total	$453 billion

Formal and informal job training totals $210 billion. To put this figure in perspective, total expenditures for the aerospace, computer, steel, and the newspaper industries equals $166 billion. This is only three-fourths the amount spent for HRD.

About 70 percent of the training and retraining for most skilled jobs is currently being provided by employers. On-the-job training (OJT) for two out of three jobs begins where formal education ends. Rapid technological change dictates the OJT that more than 80 percent of workers receive.

This OJT training and development will make an estimated 85 percent variation in employees' lifetime earnings. Formal education is only estimated to contribute 15 percent. A decade ago, these figures would have been reversed.

Changing Industries and Workforce Demographics

Changing workforce demographics have also affected HRD in many ways, such as:

- Out of 100 new hires in the 1970s, 55 were women. By 1990, 65 women out of 100 hires are projected. Within the 1990s those numbers will stabilize.
- The baby boom has been or will be soon completed, leading to a shrinking labor pool and fewer entry-level applicants.
- Business will be forced to hire less-qualified workers than in the past, which will lead to an increase in training.

Human Resource Development Shifts

Because of the change in corporation emphasis on training, there has been a status shift for those in the HRD field. Many more HRD professionals are being admitted to the boardroom and involved in corporate strategic planning. There has been an increase in training staffs, primarily in deregulated industries, like the banking industry, and also in the service industries. Salaries and titles of HRD personnel have been significantly elevated.

There has been a shift by corporate trainers toward greater use of outside training sources. Included are many of the nation's educational institutions that will conduct this job-related training. A Conference Board study (Lusterman, 1985) found:

- More than one-third of corporate training was provided externally.
- More than half of the companies surveyed reported an increase in outside resource use.
- Corporations used schools for 63.5 percent of their external training. Nonschool providers accounted for 36.5 percent.
- Many major corporations have contracted with colleges to provide training. For example, Xerox engineers keep current with technological developments through training provided by Rochester Institute of Technology, Rochester, New York.

There is also an increase in corporate colleges. There are now 18 corporate colleges, where employees can earn degrees. Within the next 5 years, the Carnegie Foundation estimates that number will grow to 31.

Future Training Needs

Future training will be geared to specific corporate needs. There has been movement away from equal employment opportunity (EEO) issues and toward more strategic business issues. Employee performance and practicality are emphasized rather than employee satisfaction, when determining training content. We are becoming more needs driven in designing our training programs. They are far more performance related and also strategically tied to organizational plans.

Other trends in the HRD field include:

- An increase in management, technical, and sales training.
- More emphasis placed on the bottom-line and making sure that HRD professionals understand that they are responsible for contributing to it.

- Greater use of the new technology in training. High-tech training includes computer use--an area that did not grow as fast as originally thought. The reason for this may have been the large capital outlay, but that does not mean that this area will not see future growth.

Our Challenges

There are three major points to keep in mind as we face future technological and societal challenges. They are the reasons for education and business ties and will determine our success in preparing for work beyond the year 2000. These points include:

- Cooperation and collegiality;
- Constant change; and
- Employee potential.

Cooperation and Collegiality. Cooperation among educators and business persons is not new. I have been hearing about this for 25 years. I know there has been tremendous progress, but I hope these efforts will accelerate. Sharing information about work and research is important. The greatest results, I believe, will come from local level cooperation.

Constant Change. Change can be overwhelming. We need to align our sights and our priorities. In aligning those priorities we must train people so that they are well-equipped to enter the job market and make a contribution to the economy or community.

As educators we must not only teach job specifics, but also processes, to help employees cope with inevitable future job changes.

As educators we must not only teach job specifics, but also processes, to help employees cope with inevitable future job changes. Teaching trainees, whether they are in school classrooms or corporate classrooms, how to learn, problem solve, and create, must be our goal. The jobs they are doing today may not exist in 18 to 24 months, so these skills are essential.

Employee Potential. Studies have consistently shown that the more education employees have, the more their work ethic increases. However, we need to keep in mind that when surveyed, only 23 percent said they worked at their full potential; 44 percent said they only did what they needed to do; and 75 percent said that they could do more.

Almost 75 percent of employees said that new technology made their work more interesting and more than 50 percent said it allows them more on-the-job autonomy. Moreover, new service workers appear to have substantial control over the level and quality of services delivered. In short, people want to work to their full potential and yet they don't.

Modern organizations and American management practices have not been able to keep pace with the high discretion work place and increasing value of individualism and participation that is being imparted to more people through increased schooling.

Daniel Yankelovitch and other researchers who have studied this conundrum, concluded (Yankelovitch & Immerwahr, 1983) that the real cause of our problem is that modern organizations and American management practices have not been able to keep pace with the high discretion work place and increasing value of individualism and participation that is being imparted to more people through increased schooling.

In our modern economy, with high levels of mass education, the reasons for working tend to shift from sustenance, from accumulation of wealth, toward a set of values Yankelovitch and Immerwahr (1983) call "expressivism." Expressivists expect work to provide them with identity, inner growth, individual autonomy, participation, a sense of community, challenge, and growth. In exchange they are willing to be team players and work hard.

In this age of accelerating competition and technology, it is the quality of human resources that will maintain our competitive edge.

The American Society for Training and Development's Chief Economist Anthony Carnevale, pointed out in his November 1986 speech to the Council of Chief State School Officers that we are beginning to recognize that in this age of accelerating competition and technology, it is the quality of human resources that will maintain our competitive edge. His talk on "Education and the Economy" mentioned that the more forward looking among the nation's employers have begun to design industrial organization and management practices that are more in line with the cultural and participatory values of a highly-educated population.

Finally, schools are being asked to provide students with basic affective and cognitive skills for a job market where change is the norm, where people work in teams and not as individuals, where knowledge is useless without the skill to communicate, and where there are problems to be solved rather than questions to be answered. The convergence of education and business begins on a firm footing of past successes and the promise of changing work place relationships. The challenge for all of us is to work toward developing the leadership necessary to do the task. We will better meet that challenge by working together on jointly-arrived-at issues, rather then taking our own preferred routes.

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Terry K. Broomfield was the 1986 president of the National Society for Training and Development and is currently principal of her own firm, Broomfield and Associates, Huntington Beach, California.

The Future of Education and Training: Issues to Consider

This text was edited from a presentation made by Howard S. Bellman at "The Future of Working Wisconsin" conference.

This paper is an attempt to forecast some of Wisconsin's policy issues affecting employment and training. The outcomes of debates over these issues will not be addressed. It should be noted that we often simply project current trends; that is different from predicting outcomes. Mainly, the difference between ultimate outcomes and the extension of current trends depends on the quality of leadership. Strong leaders will cause us to reexamine current directions. Being uncertain of our leadership's promise, I will not venture to predict outcomes.

I hasten to emphasize at the very outset that the Wisconsin system is excellent.

I fear that my presentation has a negative cast, or at least a worried tone. That derives from my assignment--to speak to the issues. I hasten to emphasize at the very outset that the Wisconsin system is excellent. It is excellent compared to other states and it is excellent compared to our own state's past. Please do not forget that I have said this as I proceed.

I will comment on several issues that are not uniquely employment and training issues even though that is the niche to which I have been assigned. There are five issues that emerge as most critical for the system:

- Identity crisis.
- Governance in question.
- Retrenchment of federal programs.
- Redundancy with other educational institutions.
- Privatization or employer training.

Identity Crisis

The first issue is a pervasive identity crisis. The segmentation of the panel on education and training for "The Future of Working Wisconsin" conference is symptomatic of this. I believe that there is no prevailing consensus in Wisconsin as to the mission of our system. That is a very fundamental difficulty as one attempts to describe the future.

It should not be surprising that after 75 years the system has drifted a bit, or has accepted a number of missions, the conglomeration of which leaves it ambivalent and ambiguous.

Our system has just celebrated its 75th birthday. That is old for a government undertaking. It should not be surprising that after 75 years the system has drifted a bit, or has accepted a number of missions, the conglomeration of which leaves it ambivalent and ambiguous. That very thing has occurred in other older government programs and systems. It is something to be concerned about.

One indication of this is having our finger in the political wind a great deal. That reflects insecurity based on no longer knowing our mission or what is expected of us. Are we here for economic development, as an employment and training agency, or to serve in some to other orientation? Until the mission is clarified within the system, those outside the system will continue to raise questions and capitalize on this inconsistency.

Governance in Question

Still another indicator that we lack a basic consensus is the current debate and flux over the system's locus of policy development. Are we basically local or centralized? Should governing boards by elected or appointed; and if so, by whom and in what categories? Should the system be led by a board of regents or by a cabinet secretary? Should we base our mission on our structure or our structure on our mission?

I feel that we should place more weight on the central aspect of the system--the state board and the state agency.

I feel that we should place more weight on the central aspect of the system--the state board and the state agency. That is not to say that I would centralize the system or eliminate the local board or local governance, but I would shift the balance more toward the state level.

There seem to be a fundamental, 75-year-old philosophical premise that underlies localism--a local economy to which local people may respond. But who drew the lines to divide these "local economies?" It surely wasn't an economist! These lines separating vocational districts are not drawn to describe economies! The state on the other hand is more of a unified economy. Because of this, I would suggest shifting some policy to the state level where there is a more plausible economy to which we may respond.

In addition to these questions respecting the organizational structure of our leadership: How do the governor and legislature fit in? What image does our system give to them?

In this regard I would assert that if we are going to be substantially state funded we must present a strong and real *system.* To compete for scarce state money we must present ourselves as unified, not fragmented.

Retrenchment of Federal Programs

In view of this compound scarcity of resources we must correct redundancy and stress coordination.

We are all aware of the current discussion on welfare reform. To the extent that our system has an employment and training role, it will not escape notice in those discussions. Similarly, we participated in economic development programming as the political pendulum swung in that direction in the early 1980s.

Participating in welfare reform by providing employment and training programs brings our attention to federal retrenchment. The withdrawal of federal funding for employment and training programs, added to our current efforts to relieve the property and income tax payer and to emphasize a comparatively-low tax state as a matter of attracting economic development, places a premium on efficiency. In view of this compound scarcity of resources we must correct redundancy and stress coordination.

I am not certain about the relationship of welfare reform to tax relief. I would like to believe that we are worrying about welfare clients and their work ethic, and not simply about the welfare program's cost. If the latter is the case, we may be looking to employment and training programs because they seem to provide an appropriate redirection of people from welfare programs. In turn, we will have to place those who complete our employment and training programs with employers. And those placements will consume the jobs otherwise available to graduates who are not from the welfare population.

There is an extremely important policy issue for our system growing out of welfare reform and federal retrenchment respecting appropriate levels of service to *all* populations--not just those served by targeted programs.

My proposal for job centers suggests a highly-coordinated and very broad offering of employment and training programs.

Many are familiar with my proposal for job centers. It suggests a highly-coordinated and very broad offering of employment and training programs. I am especially heartened by Governor Thompson's support for this concept in his recent budget message. You know that I envision a very special role for Vocational, Technical, and Adult Education (VTAE) campuses as center sights where a medical clinic model can be pursued.

Redundancy with Other Educational Institutions

My fourth issue is related to the first three. It is the alleged or potential redundancy of our schools with other educational institutions. I do not worry about overlapping with the K-12 system because that matter is being substantially and substantively addressed by the two systems. Rather, there seems to be more cause for concern in the apparent drive for redundancy with the University of Wisconsin (UW) system. That dynamic seems less attributable to interest in the economy or the general population than to ambition on the part of certain people in this system who would prefer another kind of system. (This also relates back to the matter of a pervasive identity crisis.)

If we need a new college system we should come to that conclusion by a rigorous intellectual process.

If what you have is a duck and what you need is a goose, you can't produce the goose by pulling on the duck's neck. We have a system that has a certain history. It was designed to do certain things very well. If we need a new college system we should come to that conclusion by a rigorous intellectual process. Then we must consider whether reconfiguring the VTAE system will yield the needed system--or will just be pulling the duck's neck. Perhaps an entirely new system would better meet these needs.

I realize that my position on this subject has angered people. But I would remind them that you can change your clothes, and even your politics, *but you can't change your grandmother*. This system has a history and a tradition in which pride should be taken, even when it is not trendy to do so. It is disrespectful of the quality of that history to advocate "elevating" the system to another category that threatens redundancy with the UW system.

I object to the notion that improving means lifting ourselves beyond the reach of our traditional clients.

Once again, as in the case of welfare reform programming, I am worried about service to a certain segment of our population--a segment that the system has served with excellence for decades and that may not be identified as the population served by the UW. That is elevation in a very arrogant sense. I object to the notion that improving means lifting ourselves beyond the reach of our traditional clients. I worry that it is symptomatic of a detachment from historic roots that comes when an institution gets old and forgets its past. I do not think that it is elevation at all, *but merely trying to change your grandmother*.

Privatization or Employer Training

The final issue is "privatization." There is impressive data indicating that the very employers served by the system may take over providing vocational education. We perceive this as a terrible threat. Likewise, we worry about competing with private educational entities. I would only offer two observations. First, we should be concerned that by serving as an element of welfare reform strategies, we will lose our traditional student populations to private educational providers. On the other hand, program quality is served immeasurably by integrating that traditional population with the clients of targeted programs.

Secondly, I would assert that we have not been nearly analytical enough--especially as we rushed to serve economic development--about whether it is a threat or not for employers to train their own employees. We need to develop a policy in this respect that identifies the employer's share and the public share of this responsibility.

Conclusion

All of the issues that I have identified are interrelated. Ways to address them must be considered in terms of their consequences to the overall system, its students, and job demands. Only in this way can we hope to be prepared for work in the future.

Howard S. Bellman served as secretary of the Department of Industry, Labor, and Human Relations from 1983 to 1986 and was a member of the Wisconsin State Board of VTAE during that time. He is currently engaged in the practice of mediation and arbitration in Madison, Wisconsin.

SUMMARY OF PRESENTATIONS ON THE FUTURE OF EDUCATION AND TRAINING

Speakers: Dale Parnell, Terry K. Broomfield,
and Howard S. Bellman

The U.S. needs a national strategy to develop its most precious resource--its human resource--and to meet the needs of the information age. This country is moving from an industrial economy to an information economy with smaller corporations of highly-trained workers. Business is stressing productivity as well as human capital and training and development is becoming more important.

Despite this emphasis on human capital, not everyone is headed for a baccalaureate degree. Only 20 percent of the adult population will hold a bachelor's degree in 1990. More importantly, one out of four students will not complete high school. These statistics not only represent a tremendous waste of human resources, but also a large share of the population unqualified for the workforce. Seventy-five percent of all jobs will require some form of postsecondary education by 1995. A math, English, and reading base is necessary to succeed in jobs. In future technician-oriented jobs, an associate degree or vocational diploma will become more important.

Changing work force demographics are influencing the level of training required and changing industries are restructuring the job training necessary. Clear signals must be given to high school students on what will be required to succeed in the workforce. Postsecondary educational institutions must stress their exit requirements to help students prepare for future jobs, offer programs of substance and structure, and coordinate curricula with secondary schools.

The people who will be in the workforce in the year 2000 have already been born. Everyone can be successful in the work place if they are adequately prepared. Postsecondary education must not only teach job specifics to prepare workers, but it must also teach people to learn, problem solve, and handle change. The quality of America's human resources will maintain our competitive edge, but schools must provide the knowledge and cognitive skills for people to survive in a changing world.

After 75 years, Wisconsin's postsecondary educational system appears to have drifted from its purpose. It has become insecure over its role and whether that role should be as an educational system, a training system, or an economic development system. There are also questions about the system's governance and whether the system should have increased state or local control.

To be successful, the Wisconsin VTAE system must be a *system*. It must show that it is not redundant with other systems and that it is well coordinated. As federal programs retrench, it will be necessary to coordinate with other agencies and become more efficient. The system should not attempt to either overlap with the UW system or become something it is not. If Wisconsin's VTAE system does not get on with its role, employers will do the educating and training themselves. Wisconsin's VTAE system must consider these issues in terms of their consequences to the overall system, its students, and job demands in order to be prepared for future work.

CRITICAL ASSUMPTIONS AND ISSUES RELEVANT TO THE FUTURE OF EDUCATION AND TRAINING

Assumption

Skill levels required for many jobs will be increasing.

Issue

Should specific exit requirements or competencies be established by the state or individual districts for VTAE students or graduates?

Assumption

Education and training by the private sector will continue to increase.

Issue

Should VTAE schools expand customized training activities in the private sector?

Assumption

There will continue to be questions and differences of opinion as to the mission, priorities, and financing of the VTAE system.

Issue

Should shared governance in the VTAE system be maintained? Should the present mission of the VTAE system be maintained? To what extent should alternate sources of support (local, state, or federal taxes; student fees; private business and industry contributions, excluding taxes) fund the VTAE system?

Assumption

Problem solving skills will be increasingly important for employment.

Issue

How can the VTAE system improve students' problem solving skills?

Assumption

Articulation between the VTAE system and secondary schools should be improved and expanded.

Issue

What is the relationship between the vocational system and secondary schools in providing occupational training?

ADDITIONAL RESOURCES FOR THE FUTURE OF EDUCATION AND TRAINING

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THE FUTURE OF WORKING WISCONSIN

APPENDIX

Agenda from
"The Future of Working Wisconsin"
conference

WELCOME

Welcome to the Governor's Conference on "The Future of Working Wisconsin." The conference was planned as part of the celebration for the 75th Anniversary of the Vocational, Technical and Adult Education System. Activities during this anniversary year have recognized past accomplishments of the System and of the individuals that have led the System to become one of the finest in the nation.

It is with the future, however, that we must be concerned. As leaders in business, industry, agriculture, government, labor and education we can make a positive contribution to preparing our workforce to meet the needs of the 21st century. During these three days, program leaders are faced with the challenge of helping us see the "big picture" of various segments of the nation's future. What will life in the future be like for us and those who follow? How will the national and world economy affect our daily lives?

As you look at the program you will see that an outstanding group of leaders from diverse backgrounds has been assembled to help increase our awareness of possible scenarios that may take place in the years ahead. Economics, business, industry, labor, health, agriculture, and the environment will all influence the future of work and society. This conference has been designed to address the broad employment and economic issues as we look to the future. While education and training have not been neglected, it is the intent that specific directions for these areas be addressed after we learn of the projected needs of work during the next twenty years.

On behalf of the Wisconsin Board of Vocational, Technical and Adult Education, the Vocational Studies Center and the planning committee, we challenge you to fully participate in the conference and use the information to make this world a better place to work and live in the future.

Robert P. Sorensen
State Director
Wisconsin Board of Vocational, Technical
and Adult Education

Merle E. Strong
Director
Vocational Studies Center
University of Wisconsin-Madison

Planning Committee Members

Edward Chin
Wisconsin Board of Vocational, Technical and Adult Education

Chere Coggins
Association for Adult and Continuing Education

John Cottingham
University of Wisconsin-Platteville

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Merlin Gentz
Instructional Services Subcommittee of the VTAE Administrators' Association

James Haney
Wisconsin Manufacturers and Commerce Association

Pat Holy
Wisconsin Vocational Association

Hartley Jackson
Department of Industry, Labor and Human Relations

Daniel Jarosik
Council on Vocational Education

Dennis Ladwig
Administrative Services Subcommittee of the VTAE Administrators' Association

Eugene Lehrmann
Vocational, Technical and Adult Education Foundation

Roger Lambert
Vocational Studies Center
University of Wisconsin-Madison

Linda Lucas
Wisconsin Career Information System
University of Wisconsin-Madison

David Mendel
Vocational, Technical and Adult Education Consortium

Earl Mihlbauer
Wisconsin Vocational, Technical and Adult Education District Boards Association

John Minter
Wisconsin Student Council for Technical Education

Orville Nelson
University of Wisconsin-Stout

William Neverdahl
Adult and Continuing Education Subcommittee of the VTAE Administrators' Association

Jack Reihl
AFL-CIO

Judith Rodenstein
Vocational Studies Center
University of Wisconsin-Madison

Connie Salveson
Wisconsin Federation of Teachers

Melvin Schneeberg
District Directors' Association

Marvin Schrader
Research, Planning and Development Subcommittee of the VTAE Administrators' Association

Robert Sorensen
Wisconsin Board of Vocational, Technical and Adult Education

Merle Strong
Vocational Studies Center
University of Wisconsin-Madison

Mary Thompson
Department of Industry, Labor and Human Relations

Tony Vissers
Student Services Subcommittee of the VTAE Administrators' Association

Gabrielle Banick Wacker
Vocational Studies Center
University of Wisconsin-Madison

Welcome

Tuesday morning, February 24

Crystal Ballroom, 5th Floor **General Session**

7:30 - 9:00 a.m.	**Registration - 4th floor foyer** *Continental Breakfast - rolls, juice, coffee* **4th and 5th floor foyers**
9:00 - 9:30 a.m.	**Welcome** ***Robert P. Sorensen,*** State Director, Wisconsin Board of Vocational, Technical and Adult Education **Conference Overview** ***Merle E. Strong,*** Director, Vocational Studies Center, University of Wisconsin-Madison **"This Is My Future"** ***Seth Harris,*** Madison Public Schools

Economics and Demographics: National Perspectives

Tuesday morning, February 24

Crystal Ballroom, 5th Floor **General Session**

Chairperson: ***Merle E. Strong,*** Director, Vocational Studies Center, University of Wisconsin-Madison

Hosts: ***Orville Nelson,*** Co-Director, Center for Vocational, Technical and Adult Education, University of Wisconsin-Stout
Hartley Jackson, Bureau Director of Labor Market Information, Department of Industry, Labor and Human Relations

9:30 - 10:30 a.m. ***David R. Obey,*** U.S. Representative and Chairperson of the Joint Economic Committee and House Appropriations Sub-Committee on Foreign Operations

Congressman Obey's presentation will focus on the major changes that are likely to occur in the economy over the next decade, the impact of these changes, and the challenges they will create in education and human resource development.

10:30 - 11:00 a.m. **Break - coffee served in the 4th and 5th floor foyers**

11:00 - 12:00 noon ***Ronald E. Kutscher,*** Associate Commissioner, Office of Economic Growth and Employment Projections, Bureau of Labor Statistics

National and worldwide demographics provide a foundation for occupational projections. It is essential to understand the impact of demographics on society and the workplace in order to train and educate the workforce effectively. Mr. Kutscher's examination of these issues will provide a framework for the conference.

John Coughlin, Secretary of the Wisconsin Department of Industry, Labor and Human Relations, will introduce Mr. Kutscher.

12:00 - 1:30 p.m. **Lunch on your own**

Economics and Demographics: Implications for Wisconsin

Tuesday afternoon, February 24

Crystal Ballroom, 5th Floor **General Session**

Chairperson: ***Eugene Lehrmann,*** President, Vocational, Technical and Adult Education Foundation

Hosts: ***Jim Urness,*** Bureau Director, Wisconsin Board of Vocational, Technical and Adult Education
William Neverdahl, Assistant Director, Continuing Education, District One Technical Institute.

1:30 - 2:40 p.m.	***Dena G. Stoner,*** Economist for Human Resources, Joint Economic Committee of the U.S. Congress ***David M. Zach,*** Corporate Information Specialist, Northwestern Mutual Life Demographic trends and changing societal values have a great impact on the workplace and on the family. Dr. Stoner and Mr. Zach will discuss the implications that these trends and values have for Wisconsin.
2:40 - 3:00 p.m.	**Break - coffee served in the 4th and 5th floor foyers**
3:00 - 5:00 p.m.	***John Shank,*** International Business Consultant, World Venture Management, Milwaukee; Vice President, Milwaukee World Trade Association ***Ayse Somersan,*** Professor, Department of Agricultural Economics, University of Wisconsin-Madison ***Clare W. Zempel,*** First Vice President and Chief Economist, First Wisconsin National Bank, Milwaukee Representing both the private and public sector, these speakers will discuss the implications of Congressman Obey's presentation for Wisconsin and present their own perspectives on the future of our state's economy.
5:30 - 6:30 p.m.	**Conference Reception in the Regency Room hosted by the Wisconsin Vocational Association.**

Dinner on your own.

7:15 - 8:00 a.m. **Continental Breakfast sponsored by Unisys Corporation - 4th and 5th floor foyers.**

Governor's Address

Wednesday morning, February 25

Crystal Ballroom, 5th Floor **General Session**

Presider: ***Robert P. Sorensen,*** State Director, Wisconsin Vocational, Technical and Adult Education

8:00 - 8:25 a.m. **Governor Tommy Thompson** will describe his hopes and plans for "The Future of Working Wisconsin."

Manufacturing & Industrial Development

Wednesday morning, February 25

Crystal Ballroom, 5th Floor **Concurrent Session**

Chairperson: ***Paul Hassett,*** President, Wisconsin Board for Vocational, Technical and Adult Education

Host: ***Edward Chin,*** Assistant Director, Wisconsin Board of Vocational, Technical and Adult Education

8:30 - 9:30 a.m. ***Jerry J. Jasinowski,*** Executive Vice President and Chief Economist, National Association of Manufacturers

Mr. Jasinowski will identify trends in key sectors of manufacturing such as construction, general manufacturing, automation, and future needs for goods and services. He will provide a vision of America's future in manufacturing and industrial development.

James Haney, President of Wisconsin Manufacturers and Commerce Association, will introduce Jerry Jasinowski

9:30 - 10:00 a.m. **Break - coffee served in the 4th and 5th floor foyers.**

10:00 - 12:00 noon ***Lisa C. Berman,*** Economic Development Consultant, Wisconsin Electric Power Company
Kenneth S. Kinney, Manager of Strategic Planning, Allen-Bradley Company
Larry DeMaster, Director of Human Resources, Harnischfeger Engineers, Inc.

Wisconsin presenters will discuss the implications of future manufacturing and industrial development from the perspective of their own companies.

12:00 - 1:30 p.m. **Lunch on your own**

Agriculture, Agribusiness & Biotechnology

Wednesday morning, February 25

Regency Room, 5th Floor **Concurrent Session**

Chairperson:	***John Cottingham,*** Professor of Agricultural Economics, University of Wisconsin-Platteville
Host:	***Dennis Ladwig,*** Assistant District Director, Lakeshore Technical Institute

8:30 - 9:30 a.m. ***Ralph E. Grossi***, President, American Farmland Trust

Mr. Grossi will discuss the transitional nature of agriculture and the opportunities presented by changes in the future. He will explain the impact of federal farm legislation on the role of agriculture in the economy.

Howard Richards, Secretary of the Wisconsin Department of Agriculture, Trade and Consumer Protection, will introduce Mr. Grossi.

9:30 - 10:00 a.m. **Break - coffee served in the 4th and 5th floor foyers.**

10:00 - 12:00 noon ***Winston J. Brill,*** Vice President of Research and Development, Agracetus Corporation
Mary L. Gunderson, Director, Bureau of Economics & Market Development, Wisconsin Department of Agriculture, Trade and Consumer Protection
Russel Weisensel, Executive Director, Wisconsin Agri-Business Council

State experts will discuss the implications of Mr. Grossi's speech and present a vision of Wisconsin's future in agribusiness.

12:00 - 1:30 p.m. **Lunch on your own**

Service Industries

Wednesday morning, February 25

Monarch Room, Lobby Level **Concurrent Session**

Chairperson: ***Caroline Garber,*** Policy Analyst, Wisconsin Department of Development

Host: ***Marvin Schrader,*** Curriculum Specialist, Lakeshore Technical Institute

8:30 - 9:30 a.m. ***Joseph W. Duncan,*** Corporate Economist and Chief Statistician, The Dun and Bradstreet Corporation

Service industries have been referred to as both "the key to current economic stability and future growth" and "a false paradise." Mr. Duncan will define the service sector and describe the techniques used to measure its components. He will also discuss the economic impact of the service sector on work in the future.

Richard Smith, Executive Assistant, Wisconsin Department of Development, will introduce Mr. Duncan.

9:30 - 10:00 a.m. **Break - coffee served in the 4th and 5th floor foyers**

10:00 - 12:00 noon ***Randall Wade,*** Research Director, Wisconsin Department of Development

Nancy Johnson, Vice President, Corporate Research, American Family

Edward J. Lump, Executive Vice President, Wisconsin Restaurant Association

The economic and educational consequences of service industries in the labor market will be explored by these state experts.

12:00 - 1:30 p.m. **Lunch on your own**

Health Care Delivery

Wednesday morning, February 25

English Room, 5th Floor **Concurrent Session**

Chairperson: ***Ferdinand Leyva,*** Vice-President, Wisconsin Board of Vocational, Technical and Adult Education

Host: ***Tony Vissers,*** Dean of Student Services, Nicolet College and Technical Institute

8:30 - 9:30 a.m.	***Frederick J. Wenzel,*** Executive Director, Marshfield Clinic Changes in the health care industry are affecting both the work environment and the strategies used to deliver services to those in need. Mr. Wenzel is responsible for analyzing and resolving issues related to these changes. He will address clinical, managerial, and economic issues that will influence health care in the future. ***Lois Hess,*** Health Occupations Consultant, Wisconsin Board of Vocational, Technical and Adult Education, will introduce Mr. Wenzel.
9:30 - 10:00 a.m.	**Break - coffee served in the 4th and 5th floor foyers.**
10:00 - 12:00 noon	***Aleta A. Barmore,*** Executive Director, Wisconsin Homecare Organization ***Patrick Brady,*** Executive Director, Group Health Cooperative; President, State Organization of HMO's ***Sister Julie Hanser, D.C.,*** President and Chief Executive Officer, St. Mary's Hospital, Milwaukee Wisconsin speakers will respond to Mr. Wenzel's presentation by addressing the future of health care from their particular vantage points.
12:00 - 1:30 p.m.	**Lunch on your own**

Computer Technology

Wednesday afternoon, February 25

Crystal Ballroom, 5th Floor **Concurrent Session**

Chairperson: ***Richard Dignan,*** Director, Bureau for Vocational Education, Wisconsin Department of Public Instruction

Host: ***Kenneth D. Douglas,*** President, Wisconsin Student Council for Technical Education

1:30 - 2:30 p.m. ***Harvey Long,*** Education Advisor, IBM Corporation, Washington, D.C.

The microcomputer, originally considered a sophisticated toy, has become a valuable tool for business, research, and education. It is expected that the computer and its technology will be applied to a wide variety of seemingly unrelated problems in the future. This presentation will discuss the state of the industry and its untapped resources.

Patricia Holy, President, Wisconsin Vocational Association and Dean of Business and Graphic Arts, Milwaukee Area Technical College, will introduce Dr. Long.

2:30 - 3:00 p.m. **Break - coffee served in the 4th and 5th floor foyers**

3:00 - 5:00 p.m. ***Gerald Lauer,*** Automated Process, Inc.
Frank Groom, Division Manager, Information Services, Wisconsin Bell, Inc.
John Beetem, Professor of Electrical and Computer Engineering, University of Wisconsin-Madison

Presenters from both business and education will discuss the implications that computer technology has for the future of work in Wisconsin and identify the challenges and opportunities in this field.

Communication Technology

Wednesday afternoon, February 25

Regency Room, 5th Floor **Concurrent Session**

Chairperson: ***Glenn Davison,*** Assistant Director, Wisconsin Board for Vocational, Technical and Adult Education

Host: ***Merlin Gentz,*** Instructional Services Administrator, Fox Valley Technical Institute

1:30 - 2:30 p.m. ***Louis A. Bransford,*** President, Public Service Satellite Consortium
Paul Norton, Executive Director, Wisconsin Public Television Network and Wisconsin Public Radio

Futurists frequently claim that no area of human endeavor is changing more rapidly than communications. The future of communications includes satellites, computers, videocassettes, cable TV, and micrographics. The impact of these technologies on education, training, and work during the next 15 to 20 years will be discussed.

2:30 - 3:00 p.m. **Break - coffee served in the 4th and 5th floor foyers**

3:00 - 5:00 p.m. ***Ronald C. Bornstein,*** Vice President, University Relations, University of Wisconsin System; Member, Educational Communications Board
Jan Sellards, Senior Communications Specialist, Sears Communication Network, President, International Teleconferencing Association
Dean J. Weston, Division Manager, Special Services, Wisconsin Bell, Inc.

These presenters will outline the role of the public and the private sector in communication technology.

Aerospace Technology

Wednesday afternoon, February 25

Westminster Room, 5th Floor **Concurrent Session**

Chairperson: *Rus F. Slicker,* District Director, Milwaukee Area Technical College

Host: *Mary Lou Steberg,* Section Chief, Wisconsin Board for Vocational, Technical and Adult Education

1:30 - 2:30 p.m. *Stephen Cook,* Policy Analyst, NASA Space Station, Washington, D.C.

Although aerospace technology is often overlooked as a factor in the future, it has a distinct role in employment and training. Mr. Cook will describe the role of the Space Station in shaping the future of the aerospace industry, the cooperative relations among nations for joint manned space missions, and the potential for commercial use of space.

Earl Mihlbauer, Executive Director, Wisconsin VTAE District Boards Association, will introduce Mr. Cook.

2:30 - 3:00 p.m. **Break - coffee served in the 4th and 5th floor foyers**

3:00 - 5:00 p.m. *Eric E. Rice,* Manager, Technology Center, Astronautics Corporation of America
Verner E. Soumi, Director, Space Science and Engineering Center, University of Wisconsin-Madison
James C. Catania, District Director, Blackhawk Technical Institute

These speakers will discuss advancements in the aerospace industry and the implications that this technology has for the Wisconsin workforce in the next twenty years.

Energy and Natural Resources

Wednesday afternoon, February 25

English Room, 5th Floor **Concurrent Session**

Chairperson: ***Chere Coggins,*** President-Elect, Wisconsin Association for Adult and Continuing Education; Professor, UW-Madison

Host: ***Sherman D. Ansell,*** Consultant, Economic Development, Energy and Handicapped Services, Wisconsin Board of Vocational, Technical and Adult Education

1:30 - 2:30 p.m. ***Kenneth D. Frederick,*** Director, Renewable Resources Division, Resources for the Future, Washington, D.C.

Every aspect of our lives and every sector of the economy is touched by the use of natural resources such as air, water, and land. The demand for these resources increases as we face technological developments, world competition, and an ever growing world population. This presentation will focus on the use of air and water resources and their relationship to work in the future.

David Hildebrand, District Director, Wisconsin Indianhead Vocational, Technical and Adult Education District, will introduce Mr. Frederick.

2:30 - 3:00 p.m. **Break - coffee served in the 4th and 5th floor foyers**

3:00 - 5:00 p.m. ***Jeffrey Brand,*** Economist and Chief Energy Forecaster, Wisconsin Gas Company
William J. Lange, Manager, Resource Planning, National Forest Products Association, Washington, D.C.; (as of March 1, 1987, Project Director, Forest Products Lab, Madison, Wisconsin)
Bruce B. Braun, Deputy Secretary, Wisconsin Department of Natural Resources

The focus of this state session will be on policy development, energy use, and the relationship of forest products to Wisconsin's economy.

The Big Picture: Opportunities for the Future

Banquet, 7:00 p.m., February 25

Crystal Ballroom, 5th Floor **Ticket Required**

Presider:	***Robert P. Sorensen,*** State Director, Wisconsin Board of Vocational, Technical and Adult Education
Introductions:	***Merle E. Strong,*** Director, Vocational Studies Center, University of Wisconsin-Madison
Hosts:	***Gabrielle Banick Wacker,*** Futures Project Coordinator, Vocational Studies Center, University of Wisconsin-Madison ***Darl Drummond,*** JTPA Education Specialist, Wisconsin Board of Vocational, Technical and Adult Education ***Roger Lambert,*** Associate Director, Vocational Studies Center, University of Wisconsin-Madison
Speaker:	***Earl C. Joseph,*** Futurist and President of Anticipatory Sciences Incorporated, St. Paul, Minnesota

Mr. Joseph is internationally recognized as a futurist, researcher, and planner. He has extensive experience in forecasting alternative futures for computers, education, agriculture, health care, and a variety of other areas.

Mr. Joseph will talk about "global futures" and how they will affect Wisconsin. He will identify the problems and opportunities for creating new jobs and designing a more desirable "work future" for Wisconsin.

7:30 - 8:15 a.m.	**Continental Breakfast - served in the 4th and 5th floor foyer**

Quality and Worker Productivity: Corporate and Labor Strategies for a New Era

Thursday morning, February 26

Crystal Ballroom **General Session**

Chairpersons:	***Jack Reihl,*** President, AFL-CIO; Chairperson, Wisconsin Council on Vocational Education ***Daniel Jarosik,*** Executive Director, Wisconsin Council on Vocational Education
Hosts:	***Terry Craney,*** Wisconsin and National Education Association Board Member; Instructor, Northeast Wisconsin Technical Institute ***Connie Salveson,*** Executive Director, Wisconsin Federation of Teachers
8:15 - 9:30 a.m.	***Rudolph A. Oswald,*** Director, Department of Economic Research, National AFL-CIO The nature of work is continually changing. Dr. Oswald will identify several of these changes and their effect on worker productivity in the future. Labor-management relations and involvement of employees in work decisions will also be addressed. *Philip Lerman,* Director, Employment and Training Institute, UW-Milwaukee, will introduce Rudolph Oswald.
9:30 - 10:00 a.m.	**Break - coffee served in the 4th and 5th floor foyers**
10:00 - 12:00 noon	***Ann Crump,*** President, Local 4600, Communications Workers of America ***Robert L. Esten,*** Director of Sales and Quality Management, Akrosil Corporation ***Robert Witte,*** Director, Management Institute, University of Wisconsin-Madison Wisconsin experts will discuss worker productivity and describe its specific implications for the future of work.

12:00 - 1:00 p.m. Conference Luncheon - served in the Empire Room (Lobby Level) or the Regency Room (5th Floor). Ticket required.

The Future of Education and Training: Trends and Challenges

Thursday afternoon, February 26

Crystal Ballroom, 5th Floor General Session

Chairperson: ***Robert P. Sorensen***, State Director, Wisconsin Board of Vocational, Technical and Adult Education
Merle E. Strong, Director, Vocational Studies Center, University of Wisconsin-Madison

Host: ***Eugene Lehrmann***, President, Vocational, Technical and Adult Education Foundation
Mary Thompson, Section Chief, Wisconsin Department of Industry, Labor and Human Relations

1:00 - 2:00 p.m. ***Dale Parnell***, President, American Association of Community and Junior Colleges, Washington, D.C.
Terry K. Broomfield, Broomfield & Associates; 1986 President, American Society for Training and Development
Howard S. Bellman, Former Secretary of the Department of Industry, Labor and Human Relations, State of Wisconsin

This final presentation will focus on the future of education and training in America from three different perspectives: public postsecondary education, corporate training, and employment and training programs.

[illegible], District Director, Mid-State Technical Institute, will introduce the speakers.

2:00 - 2:15 p.m. Closing Remarks

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